



# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA7-15 | Colne Valley to Lower Boddington

**Ecological baseline data: mammals (EC-003-002)**

Ecology

November 2013

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# Department for Transport

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# **Volume 5: baseline report - EC-003-002**

## **Ecological baseline data (CFA 7-15)**

### **Mammals**

# 1 Introduction

1.1.1 This document is an appendix which forms part of Volume 5 of the environmental statement (ES) for the Proposed Scheme. It details ecological baseline data collected for the following ecological aspects and species:

- Bats;
- Otters;
- Water vole; and
- Hazel dormouse.

1.1.2 The ecological baseline data detailed within this document relates to community forum areas (CFA):

- CFA7: Colne Valley;
- CFA8: The Chalfonts and Amersham;
- CFA9: Central Chilterns;
- CFA10: Dunsmore, Wendover and Halton;
- CFA11: Stoke Mandeville and Aylesbury;
- CFA12: Waddesdon and Quainton;
- CFA13: Calvert, Steeple Claydon, Twyford and Chetwode;
- CFA14: Newton Purcell to Brackley; and
- CFA15: Greatworth to Lower Boddington.

1.1.3 The document should be read in conjunction with Volume 2 (community forum area reports), Volume 3 (route wide effects assessment) and Volume 4 (off-route effects assessment).

## 2 Bats

### 2.1 Introduction

2.1.1 This section of the appendix presents details of baseline information relating to the presence, activity and habitats of bats for the section of the land required for the construction of the Proposed Scheme that will pass through CFA 7 to 15 inclusive.

### 2.2 Methodology

2.2.1 Details of the standard methodology utilised for bat surveys are provided in the Technical Note HS2 Ecological Surveys: Field Survey Methods and Standards (FSMS), which is included as an appendix to Volume 1.

2.2.2 A desk study search was undertaken to identify bat records within 5km of the land required for construction of the Proposed Scheme. Records dated prior to 1 October 1997 were excluded from the desk study review. Desk study records relating to bats were obtained from the following sources:

- Buckinghamshire Biological Records Centre;
- North Bucks Bat Group (NBBG);
- Buckinghamshire Biological Records Centre;
- Northamptonshire Bat Group; and
- Greatmoor Energy for Waste Environmental Impact Assessment.

### 2.3 Deviations, constraints and limitations

#### Trees

##### *Constraints and limitations*

2.3.1 Surveys of trees with regard to bats included ground level inspections, climbed inspections and emergence/re-entry surveys over the survey season of 2012 and 2013.

2.3.2 The main constraint when undertaking all these types tree surveys was adverse weather which, over the survey seasons of 2012 and 2013, included snow, high winds, rain and cold temperatures. Adverse weather affected ground-level surveys by reducing visibility of features and impeded climbed inspections owing to health and safety concerns. These conditions are unsuitable to conduct bat emergence surveys in and therefore scheduled surveys were necessarily cancelled when conditions were adverse. This impeded completion of emergence surveys at sites across the land required for construction of the Proposed Scheme.

2.3.3 Surveys were also constrained by health and safety issues when trees were assessed as being unsafe to climb. To address this, ground assessments and emergence surveys were carried out to assess the potential of these trees to support roosting bats.

2.3.4 Access was not possible to all sites and accessibility was also intermittent. This resulted in inconsistent and incomplete survey sets of some features which required

emergence surveys. In addition, where landowners did not permit trees to be climbed or tagged, this prevented trees being fully assessed and/or identified as requiring further surveys.

- 2.3.5 The hybrid Bill programme imposed a time constraint on these already seasonally-confined and weather-dependent surveys, which meant that a full set of emergence surveys (which can involve up to three visits) on all 2,000 identified tree features was not possible.
- 2.3.6 Where surveys could not be fully completed owing to the above constraints, this limitation was addressed by ensuring that assessments based on incomplete survey data were conservative to account for gaps in information.

### *Deviations*

- 2.3.7 The methodology states that every tree assessed from ground level inspections as having high or moderate potential to support roosting bats should be climbed and inspected; and subsequently three emergence surveys should be undertaken on each feature with high potential to support roosting bats and two emergence surveys carried out on each feature assessed as having moderate potential to support roosting bats.
- 2.3.8 Deviations from this tree climbing methodology were undertaken at sites where many trees assessed from ground level inspections as having high/moderate potential to support roosting bats were present. These included woodland sites.
- 2.3.9 At such sites, climbed inspections targeted trees in clusters. Where, for example, five trees with moderate/high roosting potential were clustered close together, data was gathered on these trees as a group. All five trees would be subjected to ground level inspections, with all tree features recorded and assessed. Those two or three trees within the group assessed as having the highest potential to support roosting bats were then subjected to a climbed inspection. This approach was undertaken for a whole site, enabling these usually complex habitats (usually woodlands) to be categorised into sections.
- 2.3.10 Climbed inspections were supplemented with back tracking bat surveys to establish which of these suitable trees were most likely to support bats. Back tracking bat surveys identified areas of high bat activity, which, together with data from climbed inspections, indicated where roosts were most likely to be located. These locations were then targeted by emergence surveys to determine the presence or likely absence of bat roosts and, where present, inform species and numbers of bats.
- 2.3.11 This survey method deviation was permitted in order to provide greatest understanding of the bats using and roosting in an area with many suitable potential roosting sites, without focussing on each feature individually for both climbed and emergence surveys, which would have been unfeasible at some sites, within the survey timeframe.
- 2.3.12 Sites where this deviation to the methodology was conducted comprise: Land and Buildings south-west of Tilehouse Lane (CFA7), Hartwell House (CFA11), Calvert Jubilee Local Nature Reserve LWS (CFA13), and Grebe Lake (CFA13).

## **Buildings and structures**

### *Constraints and limitations*

2.3.13 Surveys of buildings with regard to bats included external building inspections, internal building inspections (including roof voids where present) and emergence / re-entry surveys over the survey season of 2012 and 2013.

2.3.14 The main constraints to external and internal building surveys comprised restricted access to the site and/or declined access to building interiors and roof voids.

2.3.15 Heavy snowfalls impeded external building assessment at several sites within CFA11, CFA13 and CFA14, when visibility of features was obscured.

2.3.16 Where internal access was permitted, surveys of several sites was constrained by health and safety concerns. These included sites with hazards, including structural safety and the presence of asbestos, or where access was not physically possible. In these situations, interior inspections were not undertaken. A number of buildings had access permissions retracted part way through the season and, consequently, some buildings do not have a complete set of emergence survey data.

2.3.17 Adverse weather conditions (snow, high winds, and rain and cold temperatures) encountered over the survey seasons of 2012 and 2013 were unsuitable to conduct bat emergence surveys in and therefore scheduled surveys were necessarily cancelled when conditions were adverse. This impeded completion of emergence surveys at sites across the land required for construction of the Proposed Scheme.

2.3.18 Where surveys could not be fully completed owing to the above constraints, this limitation was addressed by ensuring that assessments based on incomplete survey data were conservative to account for gaps in information.

### *Deviations*

2.3.19 There were no deviations within the building survey methodologies.

## **Activity surveys**

2.3.20 This section covers activity transects (walked and driven), static detector monitoring and radio-tracking surveys. These surveys were undertaken in order to determine the areas with high bat activity and to identify important commuting routes across the Proposed Scheme.

2.3.21 Specialist activity surveys, such as radio-tracking were carried out in areas where previous data had indicated the presence of rare bats, high diversity of bat species or where the impact of the Proposed Scheme on the bat assemblage was considered likely to be significant. The specialist surveys were primarily undertaken to determine the effects of the Proposed Scheme with a higher level of confidence on more sensitive areas within the land required for the Proposed Scheme.

### *Constraints and limitations*

2.3.22 The main constraint to activity transects was lack of access to the full and continuous 3km transect required by the methodology. This occurred with regard to the walked transects in CFA9, CFA10, CFA11 and CFA14. Driven transects were undertaken within

CFA9 and CFA10 in order to sample areas where access was particularly restricted and to supplement the data set for these areas.

- 2.3.23 The main limitations when undertaking driven transects was the sensitivity of the equipment in collecting data whilst moving at speed.
- 2.3.24 As with other bat surveys, adverse weather conditions caused surveys to be cancelled and interfered with the detection rate of the detectors for surveys within April and May 2013. However, the less-intensive volume of these surveys compared with the survey regime for emergence surveys allowed more flexibility in re-scheduling activity surveys when conditions were suitable. The constraint of adverse conditions on activity surveys was therefore relatively low.
- 2.3.25 Where surveys could not be fully completed owing to the above constraints, this limitation was addressed by ensuring that assessments based on incomplete survey data were conservative to account for gaps in information.

### *Deviations*

- 2.3.26 Deviation from the survey methodology occurred for only one activity survey, at one site in CFA11. Access permission was intermittent at this location and was not granted during July 2013 only. In order to still obtain some survey data in this area for this month, a route was taken that deviated from the original transect route for this month only. The alternative route surveyed in July was along public bridle ways situated very close to the original route and around the site where access was refused.

### **Radio-tracking**

- 2.3.27 Radio-tracking surveys were undertaken at three different locations within CFA7 to CFA15 inclusive. The largest of the radio-tracking surveys was undertaken in the Bernwood Forest area, within CFA12 and CFA13, in order to better define the use of the habitat by populations of Bechstein's bats within that region. Bechstein's bats are very rare<sup>1</sup> and are on the edge of their UK and European ranges. Therefore, it was important to determine the exact impacts the Proposed Scheme on these bats.
- 2.3.28 Further, smaller radio-tracking projects were also undertaken in CFA7 and CFA9. The Colne Valley falls within CFA7, where a viaduct is proposed, which places the land required for construction of Proposed Scheme within the flight height of noctule bats. It was considered important to undertake radio-tracking projects and static detector monitoring surveys to determine if there was any collision impact risk on high flying bats, predominantly noctules but also Leisler's and serotine bats.
- 2.3.29 Radio-tracking was also undertaken within CFA9 where the land required for construction of the Proposed Scheme will surface in an ancient replanted woodland. Access was restricted in this area, allowing trapping only around the edges of the woodland. Therefore, it was important to determine the bat assemblage and activity occurring at this site using radio-tracking.

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<sup>1</sup> Bat Conservation Trust (2012), *The state of the UK's bats: National Bat Monitoring Programme Population Trends 2012*, BCT, London.

### *Constraints and limitations*

2.3.30 The main constraints within this survey type were adverse weather conditions, access to the wider area at Bernwood Forest in 2012 and access limitations to railway infrastructure.

2.3.31 Further constraints within the scope of the survey and survey equipment were encountered, as tracking bats which travel large distances within a night at high speeds can be challenging. Equipment sensitivity, access and speed can all impede the success of this survey.

2.3.32 Additionally, gaining access to sites where bats are roosting was in some instances difficult. This was a particular issue with the radio-tagged Leisler's bat, which can travel up to 10km from its roost in a night. Picking up the signal for this wide-ranging bat was therefore difficult and, in certain terrain, the signal was not detectable. The Leisler's bat roost was not located for these reasons. The radio-tagged survey for the barbastelle bat was similarly difficult, however the barbastelle roost was identified as it was within range to be detected from a road side, although access to the site of the roost was not granted. These compounded constraints resulted in collection of limited information for Leisler's and barbastelle bats.

2.3.33 Radio-tracking surveys were further subject to time constraints. Under the Natural England licence agreement, 10 days per month was given to undertake the surveys at the agreed trapping locations. Where adverse weather occurred or access for trapping sites was revoked, this resulted in surveys necessarily being cancelled and/or fewer bats being trapped and tracked and therefore reduced the data obtained from this survey.

2.3.34 Where surveys could not be fully completed owing to the above constraints, this limitation was addressed by ensuring that assessments based on incomplete survey data were conservative to account for gaps in information.

### *Deviations*

2.3.35 No deviations in methodology were undertaken for this survey type.

## **Static Detector surveys**

### *Constraints and limitations*

2.3.36 The main constraint of these surveys was equipment failure and malfunction whereby the recording devices failed to record. The incidence of this occurring was relatively low and affected approximately 5% of the surveys undertaken.

2.3.37 The revoking of access permissions at certain sites halfway through the sampling period resulted in inconsistent sampling across the CFAs.

2.3.38 Further, static devices were lost through damage caused by wildlife and livestock, and/or through theft. Examples of these occurrences were a static monitoring detector being stolen and microphone equipment being damaged by squirrels, both in the Bernwood Forest region (CFA12) and livestock damaging static detectors at Fleet Marston and Putlowes (CFA11). Additionally, four microphones were broken by adverse weather conditions across the route.

2.3.39 Land access for the Radstone area was permitted late in the 2013 survey season, resulting in surveys being undertaken over a significantly shorter period. Data from surveys is, therefore, likely to be representative of the bat assemblage and activity present in mid-summer only.

2.3.40 Brown long-eared bats were not recorded during the surveys. This is likely to be due to constraints in static detector methodology and the call characteristics of the species. As such, their presence and subsequent abundance is likely to be underestimated.

2.3.41 Where surveys could not be fully completed owing to the above constraints, this limitation was addressed by ensuring that assessments based on incomplete survey data were conservative to account for gaps in information.

### *Deviations*

2.3.42 Deviations to the static detector surveys occurred in two locations during the 2013 sampling season. These areas were Bernwood Forest (CFA12 and CFA13) and the Colne Valley (CFA7) where the detector monitoring setup methodology was altered in order to be able to answer more specific questions with regards to those areas. The deviations specific to each area are discussed below.

#### *Bernwood Forest*

2.3.43 The deviation from the methodology in the Bernwood Forest region involved the implementation of an array sampling methodology. Arrays consisted of three static detectors set up in a line perpendicular to the proposed route and also perpendicular to the existing Aylesbury Link Railway. The arrays were set up in four static locations and two floating locations, this area was inclusive from the Fishing Lakes near Edgcott road northwards to the north end of the Mega Ditch, which is south of Calvert Landfill site and Sheephause Wood in Calvert. Each static detector was set up with two microphone channels spaced at 16m from the detector. This distance was used as it is the optimum recording distance for *Myotis* species. The six locations were:

- Finemere Fishing lakes;
- Akeman Street Disused Railway;
- Grendon Junction;
- south of the Mega Ditch;
- between the north and south locations of the Mega Ditch; and,
- north of the Mega Ditch by Sheephause Wood.

2.3.44 Sampling was undertaken with two floating arrays set up in May and moved to alternating locations every week until August 2013.

2.3.45 This methodological deviation was deemed necessary to determine how the landscape in the vicinity of the construction of the Proposed Scheme was being used by the bat assemblage present, to identify key foraging and commuting habitats and to identify crossing points of the land required for construction of the Proposed Scheme. These data would form the design specification of appropriate mitigation.

### *Colne Valley*

2.3.46 At Colne Valley, deviation from the standard methodology involved sampling different heights at the same location using uni-directional microphones. This involved placing two static detectors on a tree, spaced 25m apart vertically. This was carried out on four trees at different locations in the Colne Valley. The four trees were located:

- on the periphery of the woodland at the base of the slopes edging onto Broadwater Lake;
- on the edge of the ridge within the woodland to the west;
- directly south of the Waterski Club at the edge of Broadwater Lake; and,
- to the south-eastern corner of Korda lake, north of Moorhall Road.

2.3.47 This methodology was designed to determine the proportion of bat activity and the species assemblages flying at different heights in order to better understand the potential collision risks of bats associated with the land required for construction of the Proposed Scheme. It was considered important to determine this, along with the risk to different bat species, as the land required for construction of the Proposed Scheme in this area would comprise a viaduct, which would pass through the south of the Colne Valley. Of particular interest, therefore, were the higher flying bats, namely *Nyctalus* species (Leisler's and noctules) and serotine bats, since these were most likely to fly at corresponding heights with the viaduct and therefore be at greatest risk of collision.

### *Radstone*

2.3.48 The methodology deviated at Radstone as a significantly sized Natterer's maternity roost was identified in association with a significant commuting and foraging feature, the Helmdon Disused Railway. The Helmdon Disused Railway habitat comprises unimproved calcareous grassland and dense scrub and provides a linear habitat feature passing from the north to the south, linking other suitable habitat in the landscape. It is located to the east of Radstone church, which is the location of the Natterer's maternity roost.

2.3.49 The deviation to the survey methodology was required here to identify numbers and species assemblage of bats using the Helmdon Disused Railway and determine the proportions of bats moving northwards and southwards along Helmdon Disused Railway. The land required for the construction of the Proposed Scheme is located within 100m of this area and bisects Helmdon Disused Railway further south. This would sever the potential foraging resource and commuting link that was likely to serve the Natterer's maternity roost. It was therefore important to better understand the use of Helmdon Disused railway by bats and therefore determine the potential impact on the bat assemblage, including the Natterer's maternity colony, within this area.

2.3.50 The survey deviation therefore involved placing static detectors at four locations at Radstone. These locations comprised:

- Helmdon Disused Railway, to the north east of the Natterer's maternity roost at Radstone;
- Helmdon Disused Railway, to the south east of the Natterer's maternity roost at Radstone;
- a tributary of the River Ouse which connects to the Helmdon Disused Railway; and,
- in a small coppice area surround by arable field to the south west of the Natterer's maternity roost at Radstone.

2.3.51 This survey approach provided data to better understand how bats use the wider landscape around Radstone. Collectively, these data informed impact assessments and mitigation design for this area.

## Reporting

### *Constraints and limitations*

2.3.52 None apply.

### *Deviations*

2.3.53 The main deviations when reporting have been the use the acronym 'ppn' which stands for 'passes per night'. This refers to the counts of bat species passes in one night collected from static detector surveys.

2.3.54 A 'pass' for the purposes of these bat data is defined as being one Analook sound file which contains at least one call from a bat species. For example, two passes per night of common pipistrelle would indicate that two Analook sound files each contained at least one common pipistrelle call per night.

2.3.55 In the context of these bat surveys, 'peak counts' are defined as the highest number of passes per night recorded at one static detector location within a defined sampling period. For example, if the sampling period comprised three nights in June when bats were recorded by a static detector, and data recorded was as follows: 10 common pipistrelle ppn, 11 common pipistrelle ppn and 100 common pipistrelle ppn, the peak count would be taken as 100ppn of common pipistrelles for that sampling period.

2.3.56 Activity levels have been defined in terms of low, moderate and high, and are described in relation to the activity of that particular species. For example; common pipistrelles activity of 200-500 passes per night (ppn) would be considered moderate, as activity can peak at 2-3000ppn which would be classified as very high. However, Nathusius' pipistrelle activity is considered high if 100-200ppn are recorded, as they are rare and have more restricted habitat requirements. Numbers of other species rarely reach the same levels of common pipistrelles. Therefore, comparing activity levels of less common or rare species with each other rather than with common pipistrelles provides greater insight into the relative value of these species in the area.

## 2.4 Baseline

### CFA 7 Colne Valley

#### *Overview of bat species status in the vicinity of CFA7*

2.4.1 Habitats within this area suitable to support roosting, foraging and commuting bats include water bodies, woodland and farmland, many of which are located within and adjacent to the land required for the construction of the Proposed Scheme. These are dominated by a series of large lakes including Broadwater Lake (the largest lake), Korda Lake, Harefield Moor Lake and other lakes south of Moorhall Road. Other key habitat features in this area are the River Colne and extensive mature, semi-natural broadleaved woodland. The surrounding landscape comprises farmland with broadleaved woodlands, mature hedgerows and flooded gravel pits. The gradation of habitats where Broadwater Lake meets Battlesford Wood and Ranston Covert provide opportunities for roosting, commuting and foraging bats. The land bridge separating Harefield Moor Lake and Broadwater Lake contains mature semi-natural oak and willow woodland and has potential to be of value to commuting and foraging bats. The large extent of standing water habitat and the marginal habitats along the land bridge boundaries are likely to be of high value to a range of bat species, especially those associated with foraging over water. In general, the extent, continuity, and mixture of different habitat types in this area are likely to support a variety of bat species.

2.4.2 Field surveys recorded at least 12 species of bat<sup>2</sup> in this area. A further bat species, the Natterer's bat, was identified to be present within this area from the desk study. The total bat assemblage is as follows:

- barbastelle (*Barbastella barbastellus*);
- Nathusius' pipistrelle (*Pipistrellus nathusii*);
- Brandt's bat (*Myotis brandtii*);
- whiskered bat (*Myotis mystacinus*);
- Leisler's bat (*Nyctalus leisleri*);
- noctule (*Nyctalus noctula*);
- serotine bat (*Eptesicus serotinus*);
- Daubenton's bat (*Myotis daubentonii*);
- Natterer's bat (*Myotis nattereri*);
- soprano pipistrelle (*Pipistrellus pygmaeus*);
- common pipistrelle (*Pipistrellus pipistrellus*); and
- brown long-eared bat (*Plecotus auritus*).

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<sup>2</sup> Certain species could only be identified to genus level on the basis of sound recordings; therefore, the figure of 12 relates to species which have been unambiguously confirmed in this area.

2.4.3 Field surveys indicate a concentration of bat activity and roosts in the Mid-Colne Valley SSSI where the most diverse assemblage and highest activity was recorded. This includes foraging and commuting bat activity along the River Colne adjacent to Broadwater Lake and within the surrounding woodland. Species recorded using this area include Daubenton's bat, noctule, Leisler's bat and barbastelle. Woodland and buildings in the area to the south-west of Tilehouse Lane provide roosting and foraging habitat for an assemblage that includes both common and soprano pipistrelle, brown long-eared bat and serotine.

### *Roosting (Trees)*

2.4.4 A total of 122 trees were subject to an initial ground based assessment and subsequent further detailed climbed surveys where appropriate in line with the methods described in the Field Survey Methods and Standards (FSMS) document.

2.4.5 Of the 122 trees that were initially assessed, the following results were obtained:

- five confirmed roosts were identified through climbed inspections;
- 33 trees as having high potential to support roosting bats;
- 41 trees as having moderate potential to support roosting bats; and
- the remaining 43 trees were classified as having low or negligible potential to support roosting bats. These trees were subsequently scoped out of further survey.

2.4.6 Of the 79 trees assessed as having roosts or moderate or high potential to support roosting bats:

- a total of 76 trees were subject to further surveys in the form of a tree climbing surveys during which the five confirmed roosts (noted above) were identified;
- four were reassessed as having low potential to support roosting bats and were scoped out of further surveys;
- 21 trees were subject to emergence surveys during which a further three roosts were recorded; and
- As discussed in Section 1.4, the remaining three trees were unsafe to climb and could not be subjected to further emergence surveys within the timeframe of the survey period required to meet the hybrid Bill programme. A large proportion of trees were assessed through climbed inspections, emergence and back-tracking surveys, and activity transects. As a result, the majority of roosts are likely to have been recorded where survey access was granted.

2.4.7 Two back tracking surveys were undertaken in this study area at one site; Land and Buildings to the south-west of Tilehouse Lane. A high incidence of trees with high and moderate potential were assessed at this site, therefore this methodological deviation (as discussed in sections 1.4.7 and 1.4.13) was undertaken in order to gain an understanding of the bat assemblage at this site within the permitted time.

2.4.8 Details of confirmed tree roosts in this area of the route are provided in Table 1.

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Table 1: Confirmed tree roosts within CFA7

<b>Ecology survey code</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Tree species</b>	<b>Species confirmed as utilising roost and (peak count)</b>	<b>Date of peak count and nature of survey</b>	<b>Roost type</b>	<b>Roost description</b>	<b>CFA</b>	<b>Approximate distance from the Proposed Scheme</b>
020-BT3-027004	Denham Waterski Club	TQ 045 884	Alder	<i>Myotis</i> sp., from droppings	Tree climbing inspection – 14 February 2013	Maternity	Bat box (south-east facing) – feature is located approx. 4m high - large quantities of droppings were found scattered around the bat box and the base of the tree. Roost with high numbers of droppings recorded.	7	Within 50m of the Proposed Scheme
020-BT2-027016	Broadwater Lake bat boxes	TQ 044 887	Alder	<i>Myotis</i> sp., up to 12 bats	Tree climbing inspection – 14 February 2013	Day	Bat box (no. 10). In a good location with staining around the outside and approximately 200 droppings. 10-12 bats seen emerging from the box during an emergence survey.	7	Within the Proposed Scheme
020-BT3-028001	Broadwater Lake bat boxes	TQ 040 892	Alder	<i>Myotis</i> sp., up to 10 bats	Emergence survey 18 July 2012	Day	Dense ivy. Unsafe to climb. Emergence survey identified 5-10 individuals emerging.	7	Within the Proposed Scheme
020-BT3-028002	Broadwater Lake bat boxes	TQ 040 898	Alder	<i>Myotis</i> sp. up to 3 bats	Emergence survey 16 August 2013	Day	Bat box (south-west facing) - approximately 7m from ground level. 1-3 bats seen re-entering the roost.	7	Within 50m of the Proposed Scheme
020-BT2-027001	Broadwater Lake bat boxes	TQ 043 886	Oak	Common pipistrelle and soprano pipistrelle, up to 7 bats	Emergence survey 18 July 2012- 3-7 bats	Day	Tree with 3-7 bats emerging.	7	Within the Proposed Scheme
020-BT2-027004	Broadwater Lake bat boxes	TQ 045 884	Oak	Soprano pipistrelle	Tree climbing inspection – 14 February 2013	Day	Bat droppings found, most likely pipistrelle sp. Large (over 300) quantities of droppings of varying ages.	7	Within the Proposed Scheme
020-BT2-027011	Broadwater Lake bat boxes	TQ 046 885	Oak	Common pipistrelle, 1 bat	Tree climbing inspection – 14 February 2013	Hibernation	Bat Box (no. 7). Numerous bat droppings. Pipistrelle present.	7	Within the Proposed Scheme

Ecology survey code	Location	OS grid reference	Tree species	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
020-BT2-027010	Broadwater bat boxes	TQ 046 885	Willow	Soprano pipistrelle	Tree climbing inspection – 14 February 2013	Other	Bat box (no. 5) east facing located 7m in height. Approximately 300 bat droppings within the bat box.	7	Within the Proposed Scheme

2.4.9 No data on roosts was found in the desk study records; however, there were a significant number of records for Daubenton's bats, common and soprano pipistrelles, serotine and *Nyctalus* species using the Mid-Colne Valley to forage and commute.

### *Roosting (building and structures)*

2.4.10 No data on roosts was found in the desk study records; however, there were a significant number of records for Daubenton's bats, common and soprano pipistrelles, serotine and *Nyctalus* species using the Mid-Colne Valley to forage and commute.

2.4.11 A total of eight buildings in this area were subject to external and internal inspections, resulting in the following:

- four roosts of four species were confirmed in two buildings during the internal inspections: three roosts (a common pipistrelle, a brown long-eared bat roost and a serotine roost) were identified at one site. A *Myotis* roost was found at the other building;
- one building was assessed as having high potential to support roosting bats;
- one building/structure was assessed as having moderate potential to support roosting bats; and
- the remaining four buildings were assessed as having low or negligible potential to support roosting bats, these buildings were subsequently scoped out of further survey.

2.4.12 No data on roosts was found in the desk study records; however, there were a significant number of records for Daubenton's bats, common and soprano pipistrelles, serotine and *Nyctalus* species using the Mid-Colne Valley to forage and commute.

2.4.13 Details of confirmed roosts in buildings/structures in this area of the route are provided in Table 2.

Table 2: Confirmed bat roosts in buildings/structures in CFA7

<b>Ecology survey code</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Building/structure type</b>	<b>Species confirmed utilising roost and (peak count)</b>	<b>Date of peak count and nature of survey</b>	<b>Roost type</b>	<b>Roost description</b>	<b>CFA</b>	<b>Approximately distance from the Proposed Scheme</b>
020-BS1-029001	Land and buildings on the east side of Denham Way	TQ 036 898	Residential	<i>Myotis</i> sp.	01 March 2013 Scoping/Internal building survey	Maternity	Residential property, a large manor house, with roost located in roof void. Pile of droppings under gable apex at the southern end.	7	Partially within the Proposed Scheme
020-BS2-029001	Area south-west of Tilehouse Lane	TQ 031 898	Residential	Brown long-eared bat	09 April 2013 Internal building survey	Day/transitional	Droppings scattered in void one under the ridge beam.	7	Within 150m of the Proposed Scheme
020-BS2-029001	Area south-west of Tilehouse Lane	TQ 031 898	Residential	Common pipistrelle	09 April 2013 Internal building survey	Maternity	Several droppings, approximately 200, scattered on the wall plate and floor between eastern void and void one.	7	Within 150m of the Proposed Scheme
020-BS2-029001	Area south-west of Tilehouse Lane	TQ 031 898	Residential	Serotine	09 April 2013 Internal building survey	Day	Several droppings scattered on the king truss and floor below. A further pile located at the eaves to the west.	7	Within 150m of the Proposed Scheme

### Bat activity surveys

2.4.14 The following eight species have been recorded during the range of bat activity surveys conducted in the survey area:

- barbastelle bat (*Barbastella barbastellus*);
- Natusius' pipistrelle (*Pipistrellus nathusii*);
- Leisler's bat (*Nyctalus leisleri*);
- noctule bat (*Nyctalus noctula*);
- serotine bat (*Eptesicus serotinus*);
- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*); and
- brown long-eared bat (*Plecotus auritus*).

2.4.15 Static detector survey methodologies deviated between 2012 and 2013. The 2012 methodology was consistent with the methodology within the FSMS, whereby static detectors were placed at two locations within each survey area. From the 2012 data a large number of noctules were recorded. Given that a viaduct will be built in this area, and considering that noctules characteristically fly at a higher altitude than other bats, it was necessary to better understand how noctule bats use habitats in the vicinity of this proposed structure, including when foraging or commuting. In 2013 the methodology was adapted whereby four detectors were placed at different heights on each of four trees located within the Mid-Colne Valley SSSI. This was specifically designed to detect the bat assemblages using different canopy heights and to determine the ability of the structural diversity within this site to support a variety of species. The four detector locations were all placed within 25m of land required for the construction of the Proposed Scheme where the viaduct is proposed.

Table 3: Bat activity surveys conducted within CFA7

Ecology survey code	Transect location	Number of surveys conducted	First survey date	Final survey date	CFA	Map Reference
020-BA2-028-001	Mid-Colne Valley SSSI	4 (19 nights)	26 June 2012	16 October 2012	7	TQ 044 885
020-BA2-028-001	Mid-Colne Valley SSSI	4 (48 nights)	26 June 2012	26 October 2012	7	TQ 044 885
020-BA1-028-001	Mid-Colne Valley SSSI	9 (April dawn cancelled)	18 April 2013	18 July 2013	7	TQ 044 885
020-BA2-028-001	Mid-Colne Valley SSSI	16 (185 nights)	18 April 2013	16 July 2013	7	TQ 044885

Table 4: Bat activity transect survey results - Transect 020-BA1-028-001 Denham Waterski Club

<b>Ecology survey code</b>	<b>Transect location</b>				<b>Description of habitats covered by transect</b>																
020-BA1-028-001	Denham Waterski Club				Mature semi-natural woodland over excavated ground, which slopes down to the River Colne. Dominated by ash canopy, with co-dominant alder in damper areas closer to the river. Small, more open areas dominated by hawthorn forming a low canopy.																
<b>Visit number and date</b>	<b>Weather conditions</b>				<b>Total species passes during transect survey</b>																
	<b>Temp (°C)</b>	<b>Cloud (0-8)</b>	<b>Rain (0-5)</b>	<b>Wind (0-12)</b>	<b>Pp</b>	<b>Ppy</b>	<b>Pn</b>	<b>P sp.</b>	<b>Mb</b>	<b>Md</b>	<b>Mn</b>	<b>Mm</b>	<b>Mbr</b>	<b>Mm /Mb</b>	<b>M sp.</b>	<b>Pa</b>	<b>Bb</b>	<b>Nn</b>	<b>Nl</b>	<b>Es</b>	<b>Ny/Es</b>
Dusk 27 June 2012	19	0	0	1	1	1									1			6			
Dawn 28 June 2012	17	4	0	1	1	1															
Dusk 7 August 2012	17	8	3	0	1	1												1			
Dawn 8 August 2012	15	4	1	4		3										1			10		7
Dawn 24 August 2012	13	6	0	0				4										1			
Dusk 18 April 2013					64	164	1	1								12					1
Dusk 20 May 2013								7								2			8		
Dawn 21 May 2013					15													6			
Dusk 26 June 2013					72	319	112	53								24		2			4
Dawn 27 June 2013	10	1	0	0	111	239	6	10								3			1	6	
Dusk 04 July 2013	18	2	0	1	4	30										16	3				
Dawn 05 July 2013	13	2	0	1	10	23										6	1				3
Dusk 17 July 2013	24	5	1	0	22	138	3	36								60				4	
Dawn 18 July 2013	24	5	1	0	11	103	2									14			1	3	

Sonographs from these species can be difficult to separate where only partial calls are recorded.

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat,

Ecology survey code	Transect location				Description of habitats covered by transect																
Visit number and date	Weather conditions				Total species passes during transect survey																
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (0-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Es
Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - <i>Myotis</i> bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - <i>Nyctalus</i> / <i>Eptesicus</i> bat.																					
Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.																					
Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.																					
Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane																					

2.4.16 Low activity for common and soprano pipistrelle, *Myotis* noctule and *Nyctalus*/*Eptesicus* bats during June and August 2012 .Activity transect data recorded common, soprano and *Nathusius'* pipistrelle bats in high levels throughout the 2013 season with peak counts of 111 common pipistrelle, 319 soprano pipistrelle and 112 *Nathusius'* pipistrelle passes per night (ppn). Moderate numbers of *Myotis* species were recorded with a peak count of 60ppn. Low to moderate numbers of noctules were recorded with a peak count of 10ppn. Moderate to low numbers of serotine, Leisler's and brown long-eared bats were recorded. Further to this, two barbastelle passes were recorded during one activity transect in June 2013.

Table 5: Summary of static detector monitoring results for 020-BA2-028-001 Denham Waterski Club

Ecology survey code	Location	OS Grid	Description of habitat
020-BA2-028001	Tree 1: Located on the periphery of the woodland at the base of the slopes edging onto Broadwater Lake – Ground Level	TQ 041 890	Mature semi-natural woodland over excavated ground, which slopes down to the River Colne. Dominated by ash canopy, with co-dominant alder in damper areas closer to the river. Small, more open areas dominated by hawthorn forming a low canopy.

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring <sup>3</sup> [insert the highest number of bat passes recorded on any one night during deployment]																
		Pp	Ppy	Pn	P sp	M b	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Ep
18 April 2013 – 30 April 2013	13	2234	1123	141								7			16	3		14
01 May 2013 – 06 May 2013	6	2935	2662	672								4			45			
09 May 2013 – 15 May 2013	7	1840	852	1								4			19	1		
21 May 2013 – 28 May 2013	7	502	414									8			6			

2.4.17 High levels of activity were recorded for both common and soprano pipistrelle during 2013. Peak activity for common pipistrelle was in May with a peak count of 2,935ppn. Soprano pipistrelle activity was high in all sampling periods, rising in May to a peak count of 2,662ppn. High levels of activity were also recorded for Natusius' pipistrelle in April and May 2013, with peak counts of 141 and 672ppn, respectively. *Myotis* species were recorded at low levels of activity during both April and May 2013. Moderate activity levels of noctule bats and low levels of Leisler's bats were recorded, with peak counts of 45ppn and 3ppn, respectively. *Nyctalus/Eptesicus* bat were recorded in low numbers during April 2013.

Table 6: Summary of static detector monitoring results for 020-BA2-028-002 Denham Waterski Club

Ecology survey code	Location	OS Grid	Description of habitat
020-BA2-028001	Location 1: Located on the periphery of the woodland at the base of the slopes edging onto Broadwater Lake – Canopy Level	TQ 041 890	Mature semi-natural woodland over excavated ground, which slopes down to the River Colne. Dominated by ash canopy, with co-dominant alder in damper areas closer to the river. Small, more open areas dominated by hawthorn forming a low canopy.

<sup>3</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Natusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring															
		Pp	Ppy	Pn	P sp	M b	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es
18 April 2013	1		3		1										59		
24 April 2013 – 26 April 2013	3	1862	553	18	271							1			4		2
01 May 2013 – 06 May 2013	6	3195	1900		835							3			93	2	8
09 May 2013 – 15 May 2013	7	8	2														
16 May 2013 – 21 May 2013	6	33	10												1		

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp. - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

2.4.18 Very high levels of common and soprano pipistrelle activity were recorded at the canopy level. Higher passes for common pipistrelles were recorded at canopy level compared to records at ground level, whereas the reverse was observed for soprano pipistrelle bats. *Myotis* species bats were active at low levels in both April and May 2013. Higher activity levels of noctules were recorded during May 2013 than in April 2013, along with small numbers of Leisler's and serotine bats. Low levels of *Nyctalus/Eptesicus* bat were also recorded during April 2013.

Table 7: Summary of static detector monitoring results for 020-BA2-028-003 Denham Waterski Club

Ecology survey code	Location	OS Grid		Description of habitat														
020-BA2-028-002	Location two: Located on the edge of the ridge within the woodland to the west – Ground Level	TQ 040 889		Mature semi-natural woodland over excavated ground, which slopes down to the River Colne. Dominated by ash canopy, with co-dominant alder in damper areas closer to the river. Small, more open areas dominated by hawthorn forming a low canopy.														
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
Pp	Ppy	Pn	P sp	M b	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep		
18 April 2013 – 29 April 2013	11	2139	2842	84						4			84	16	1			
01 May 2013 - 06 May 2013	6	1949	1174	549	9					5			25	5	4	107		
09 May 2013 – 14 May 2013	6	62	84														1	
21 May 2013 – 25 May 2013	4	2	20															

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Natusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.19 High levels of activity were recorded for all three pipistrelle species during 2013. Peak of activity for common and soprano pipistrelles was observed during April, whereas Natusius' pipistrelle activity was highest during May with a peak count of 549ppn. Low levels of *Myotis* species bat activity were recorded in both April and May. Noctule bats were active at high levels and Leisler's bat at low levels during April, whereas lower levels were recorded for both species during May. Higher levels of indeterminate *Nyctalus/ Eptesicus* bats were also recorded during May.

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Table 8: Summary of static detector monitoring results for 020-BA2-CFA7 Denham Waterski Club

Ecology survey code	Location	OS Grid		Description of habitat															
020-BA2-028002	Location two: Located on the edge of the ridge within the woodland to the west – Canopy Level	TQ 040 889		Mature semi-natural woodland over excavated ground, which slopes down to the River Colne. Dominated by ash canopy, with co-dominant alder in damper areas closer to the river. Small, more open areas dominated by hawthorn forming a low canopy.															
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																	
		Pp	Ppy	Pn	P sp	M b	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep	
24 April 2013 – 28 April 2013	5	1859	1097	107	33							4		3	164		2	206	
01 May 2013 – 04 May 2013	4	2233	1983	60	12							13		1	7	6	1	281	
09 May 2013 – 15 May 2013	7	1485	913	1	20		1					6			16	5	1	297	
16 May 2013 – 22 May 2013	7	1739	285	19	37							1		2	29		1	17	

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Natusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.20 High levels of activity were recorded for all three pipistrelle species at canopy level during 2013. Peak of activity for common and soprano pipistrelles was recorded in May with 2,233 and 1,983ppn respectively. Natusius' pipistrelles activity was highest in April with 107ppn. *Myotis* species bat activity was recorded at low to moderate levels in May but was lower during April. Small numbers of barbastelle and serotine bats were observed in April and May and noctule bats were also recorded in both months with the peak of activity recorded for this species in April. *Nyctalus/ Eptesicus* bats were also seen to be highly active during both April and May 2013.

Table 9: Summary of static detector monitoring results for 020-BA2-CFA7 Denham Waterski Club

Ecology survey code	Location	OS Grid		Description of habitat														
020-BA2-028003	Location three: Located directly south of the Waterski Club at the edge of Broadwater Lake – Ground Level	TQ 038 894		Mature semi-natural woodland over excavated ground, which slopes down to the River Colne. Dominated by ash canopy, with co-dominant alder in damper areas closer to the river. Small, more open areas dominated by hawthorn forming a low canopy.														
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp	M b	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	
04 June 2013 – 05 June 2013	1	573	507									191		1				
11 June 2013 – 20 June 2013	10	327	166	1		1						56		1	3		1	
03 July 2013 – 10 July 2013	7	8	201									1		1				

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

2.4.21 Moderate to high levels of soprano and common pipistrelles were recorded at this location with peaks of 573 and 507ppn, respectively. High numbers of *Myotis* species were also recorded with a peak count of 191ppn. Low numbers of barbastelle, noctule and serotine calls were recorded. Lower numbers of Nathusius' pipistrelle calls were recorded at this location adjacent to Broadwater Lake. This is compared with the other static detector monitoring locations within the woodlands and in more sheltered locations by the lake. During June 2013, low levels of noctule bat activity and a single serotine bat were recorded.

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Table 10: Summary of static detector monitoring results for 020-BA2-CFA7 Denham Waterski Club

<b>Ecology survey code</b>	<b>Location</b>	<b>OS Grid</b>		<b>Description of habitat</b>															
020-BA2-028003	Location three: Located directly south of the Waterski Club at the edge of Broadwater Lake – Canopy Level	TQ 038 894		Mature semi-natural woodland over excavated ground, which slopes down to the River Colne. Dominated by ash canopy, with co-dominant alder in damper areas closer to the river. Small, more open areas dominated by hawthorn forming a low canopy.															
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring																
04 June 2013 – 10 June 2013			Pp	Ppy	Pn	P sp	M b	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep
10 July 2013 – 16 July 2013		6	222	72									23						12
		7	89	123									15						15
Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp. - <i>Myotis</i> bat species, Pa - brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - <i>Nyctalus</i> / <i>Eptesicus</i> bat.																			

2.4.22 Comparatively moderate levels of common and soprano pipistrelles were recorded at this location with peak counts of 222 and 123ppn respectively. Moderate to low numbers of *Myotis* and *Nyctalus/ Eptesicus* species bats were also recorded at this location with peak counts of 23 and 15ppn respectively. The activity levels for each species were generally lower compared with the static detector located at Tree 4.

Table 11: Summary of static detector monitoring results for 020-028-008BA2-CFA7 Denham Waterski Club

Ecology survey code	Location	OS Grid		Description of habitat														
020-BA2-027001	Location four: Located to the south-eastern corner of Korda lake, north of Moorhall Road – Ground Level	TQ 0468 85		Mature semi-natural woodland over excavated ground, which slopes down to the River Colne. Dominated by ash canopy, with co-dominant alder in damper areas closer to the river. Small, more open areas dominated by hawthorn forming a low canopy.														
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp	M b	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Ep
11 June 2013 – 19 June 2013	9	225	69	2								1			18			
03 July 2013 – 09 July 2013	7	808	590	29								38			81			

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

2.4.23 High levels of common, soprano and Nathusius' pipistrelles, noctule bats and *Myotis* species were recorded in similar numbers at both ground level and canopy level. Peak counts for these species at ground level were 808, 590, 29, 81 and 38ppn respectively. The key difference at this height compared with canopy level is that of barbastelle bat calls recorded. At ground level no barbastelle bats were recorded, whereas at the canopy level moderate activity of this species was recorded, with a peak count of 14ppn.

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Table 12: Summary of static detector monitoring results for 020-BA2-028-007 Denham Waterski Club

Ecology survey code	Location	OS Grid	Description of habitat															
020-BA2-027001	Location four: Located to the south-eastern corner of Korda lake, north of Moorhall Road – Canopy Level	TQ 046 885	Mature semi-natural woodland over excavated ground, which slopes down to the River Colne. Dominated by ash canopy, with co-dominant alder in damper areas closer to the river. Small, more open areas dominated by hawthorn forming a low canopy.															
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp	M b	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Ep
04 June 2013 – 10 June 2013	7	1547	600	6								29		14	238			
03 July 2013 – 09 July 2013	7	63	189	2								1		2	4			

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

2.4.24 Common and soprano pipistrelles were recorded in high numbers, whereas Nathusius' pipistrelles were recorded at comparatively lower numbers than at other locations and heights in the Mid-Colne Valley SSSI. Moderate levels of *Myotis* species activity and moderate levels of barbastelle bat activity were also recorded with peak counts of 29 and 14ppn respectively. The barbastelle bat activity was comparatively higher at this location than at any other location or height in the Mid-Colne Valley SSSI. High levels of noctule bats were recorded during the June sampling period with peak night counts of 238ppn. However, this species was recorded at considerably lower activity levels during July with a peak count of only four ppn.

Table 13: Summary of static detector monitoring results for o2o-BA2-CFA7 Denham Waterski Club

Ecology survey code	Location	OS Grid				Description of habitat												
o2o-BA2-028009	Denham Waterski Club	TQ 041 890				Open lake within the Mid-Colne SSSI, adjacent to a semi natural and ancient woodland and connected with other water tributaries.												
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp	M b	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep
26 June 2012	1											26						
24 July 2012 to 27 July 2012	4	10	130		14		101	1	2		13	55 <sup>1</sup>	1					3
30 August 2012 to 09 September 2012	11 (only recorded for 2 though)	7	1		12		16					6	1		6			14
11 October 2012 to 16 October 2012	6	16	157	2	6		18					29 <sup>8</sup>			9			2

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

2.4.25 Common and soprano pipistrelles were recorded during July, August and October 2012, with peak activity for both species occurring in October. Moderate levels of soprano pipistrelle activity were recorded during the July and October 2012 sampling periods with peak counts of 130 and 157ppn respectively. Low levels of activity for Natterer's bat and whiskered bat were also recorded during July and low numbers of noctule bats were recorded during both August and October 2012. A single brown long-eared bat was recorded in both August and October 2012. Activity levels for all species, excluding *Nyctalus/Eptesicus*, were significantly lower during August compared with July and October; however, this may reflect a sampling bias as figures for this month are based on only two nights of recording, compared to four and six nights in July and October 2012. June 2012 may also be data deficient owing to data being available from only a single night.

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Table 14: Summary of static detector monitoring results for 020-BA2-CFA7 Denham Waterski Club

Ecology survey code	Location	OS Grid				Description of habitat												
020-BA2-028001	Denham Waterski Club	TQ 038 893				Open lake within the Mid-Colne Valley SSSI, adjacent to a semi-natural ancient woodland and connected with other water tributaries.												
						Species peak night count during monthly monitoring												
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Pp	Ppy	Pn	P sp	M b	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Ep
26 June 2012 to 03 July 2012	8	9			2		27					25		1				
24 July 2012 to 31 July 2012	8	2	38		37		3					1			1	1		25
22 August 2012 to 06 September 2012	16 (only recorded for 10 though)	31	22	2	3							2			6	1		5
11 October 2012 to 26 October 2012	16 (only recorded for 12 though)	1	11	1								4						

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.26 Common and soprano pipistrelle bats, and undetermined pipistrelles, were the most common species recorded at this location. Common pipistrelles were recorded in all sampling periods with the peak count of 31ppn recorded in August 2012. However, soprano pipistrelles were more abundant overall with peak counts of 38 and 22ppn in July and August/September 2012 respectively. High levels of Daubenton's bat passes were recorded during June 2012 with potential peak counts of 52ppn when taking into account numbers of undetermined *Myotis* species recorded during this time, which could also be attributed to this species. Low counts of whiskered/Brandt's bats were recorded during July and October 2012 and similarly low counts of noctule and Leisler's bats were recorded during July and August/September 2012. A moderate level of *Nyctalus/Eptesicus* bats was recorded during July 2012 with a peak count of 25ppn during this sampling period. October is comparatively under recorded for all species. A single, rare barbastelle bat was recorded during June 2012.

## **Discussion**

### *Bat Assemblage*

2.4.27 Field surveys carried out in 2012 and 2013 confirmed the presence of 13 bat species in this area, including rare, uncommon and less common species; barbastelle, serotine, Brandt's bat, whiskered bat, Leisler's bat, noctule and *Nathusius'* pipistrelle.

2.4.28 Common and widespread species including common pipistrelle, soprano pipistrelle were abundant with high levels of activity recorded roosts were located within the Mid-Colne Valley SSSI and in the area south-west of Tilehouse Lane. Common and soprano pipistrelle were the most abundant species recorded during field surveys in the area with peak counts of 3,195 and 2,842ppn respectively recorded by a single detector on one survey night. Daubenton's bat, which are commonly associated with habitats found within the area such as broadleaved woodland and standing water, were also recorded in high numbers with ppn of 651.

2.4.29 Scarce species such as Leisler's, uncommon species such as serotine, noctule and rare species including *Nathusius'* pipistrelles, whiskered bat and Brandt's bat were recorded in high numbers from field surveys (which included radio tracking and trapping) in this area. These species are classified as less common, uncommon and rare because of restricted distributions and/or low to moderate populations.

2.4.30 Low activity levels of barbastelle bat, which are classified as very rare and have a restricted range, were recorded during April, June and July with a peak count of 14ppn.

2.4.31 It was not possible to undertake tree-climbing assessments or emergence surveys on some of the land between the River Colne and the A412 as the ground is uneven and covered in dense scrub making it unsafe for survey. Access was not granted for the area between Buckinghamshire Golf Club and Moorhall Road. The lack of access may have resulted in some roosts going unrecorded, however, the areas that could not be fully surveyed were limited and are likely to support similar populations to adjacent land parcels where access was possible. Access was also possible in areas with high quality. As a result, the lack of access is not considered to be a significant constraint.

### *Roosts*

2.4.32 Roosts of common pipistrelle, soprano pipistrelles and *Myotis* species bats, some of which were confirmed as Daubenton's bat, were identified from tree roosts and bat boxes located within the Mid-Colne Valley SSSI. A total of nine roosts at eight different trees were confirmed from climbed inspections and emergence surveys. Four roosts were located within woodland to the west of Broadwater Lake. The other four trees which contained roosts were located within woodland surrounding Korda Lake. All roosts are located within (six roosts within, one partially within) or adjacent to (five roosts within 150m) of land required for the construction of the Proposed Scheme. High levels of foraging and commuting activity from each of these species were recorded during activity transect and static monitoring surveys.

2.4.33 A total of four roosts were confirmed in buildings and structures in the area. These included a *Myotis* sp. roost in a residential building located to the west of the Broadwater Lake and transitional roosts for brown long-eared bat, common pipistrelle and serotine confirmed within the area south-west of Tilehouse Lane. This site is partially located within the 100m buffer zone of the land required for the construction of the Proposed Scheme.

### *Foraging Habitat*

2.4.34 Land within the extent of and adjacent to the Proposed Scheme is dominated by several large lakes, associated marginal habitat and semi-natural broadleaved woodland around the lakes and in Ranston Covert and Battlesford Wood. It also comprises a section of the River Colne. The wider landscape comprises farmland, broadleaved woodland, mature hedgerows and flooded gravel pits. Each of these habitats are of potential value to foraging bats in the area.

2.4.35 High levels of foraging activity were recorded at several locations during transect surveys; in particular the woodland which slopes over the ridge on the western edge of the Mid-Colne Valley SSSI. This area featured particularly high levels of activity for soprano, common and Natusius' pipistrelles, as well as *Nyctalus* and *Myotis* species bats. High activity of *Myotis* species bats and Natusius' pipistrelles were also recorded along the lake complexes, in particular Korda Lake and Broadwater Lake where multiple Daubenton's bats were recorded foraging. Trapping surveys further determined the presence of whiskered, Brandt's and Natterer's bats foraging between the River Colne, Broadwater Lake and the woodland to the west.

2.4.36 There was a notable difference in numbers of passes per night amongst species and between the static detectors that were placed at different elevations on the same tree. At a tree located adjacent to Broadwater Lake (Location one), the ground level detector recorded peak counts of 2,935 and 2,662 common and soprano pipistrelles and 672 Natusius' pipistrelles. Higher numbers of noctule bats were recorded in the canopy level with a peak count of 93ppn compared with ground level records, which had a peak count of 45ppn from noctule bats. Furthermore, at the canopy level higher numbers of common and Natusius' pipistrelles were recorded with 3,195 and 835ppn respectively, compared with 2,935 and 672ppn recorded at ground level. Both Leisler's bats and serotines were also recorded in higher numbers at canopy level with a peak count of 46ppn for Leisler's (at Location two; a tree located on the ridge at the

western aspect of the Mid-Colne Valley) compared with 16 at ground level. This pattern was replicated for noctules (peak count of 164ppn at Location two (the edge of the ridge within the woodland to the west) compared with 84ppn at ground level) and serotine bats.

2.4.37 High levels of *Nyctalus/Eptesicus* species bats were also recorded during the static detector monitoring surveys. Activity from these genera was concentrated between Location one (the periphery of the woodland at the base of the sloped edging onto Broadwater Lake) and Location two (the edge of the ridge within the woodland to the west). Field surveys identified that noctule, serotine and Leisler's bats were mostly foraging above the tree canopy. Natusius' and common pipistrelles, some *Myotis* species and barbastelle bats were recorded foraging at canopy height but also frequently at the height of understorey vegetation. Soprano pipistrelles, Daubenton's and whiskered bats were recorded foraging predominantly at the height of understorey vegetation and over open water. The survey methodology, where by static detectors were placed at different heights, suggests that structural diversity is very important in supporting bats that use the understorey and those which forage at canopy level. The four detector locations were all placed within 25m of land required for the construction of the Proposed Scheme where a viaduct is proposed.

2.4.38 Barbastelle bats were recorded in low numbers across Location one (the periphery of the woodland at the base of the sloped edging onto Broadwater Lake) and Location two (the edge of the ridge within the woodland to the west) three (directly south of the Waterski Club at the edge of Broadwater Lake), and four (south-eastern corner of Korda Lake, north of Moorhall Road) with a peak count of 14ppn at Location four; the tree on the south east corner of Korda Lake. There were low numbers of ppn from barbastelle bats, but activity was consistent throughout the sampling period. Barbastelle bats are classified as nationally rare and have a restricted population within England. This habitat is likely to form part of a wider home range for this species which is known to travel several kilometres from a roost to forage.

2.4.39 Back tracking surveys at the area south-west of Tilehouse Lane found high levels of activity from common and soprano pipistrelles and moderate numbers of serotine, *Nyctalus* and *Myotis* species and brown long-eared bats. This indicates that the site has suitable habitat that supports moderate to high numbers of bats and provides roosting sites and foraging areas for local bats.

2.4.40 The prevalence of less common species and a nationally classified rare species in and around the Mid Colne Valley SSSI suggests that the overall quality of the habitat present is able to support populations of large numbers of bats and a high diversity of species, which contributes to the importance of foraging habitat in this area.

### *Commuting Habitat*

2.4.41 Semi-natural and ancient woodland connected by water bodies associated within the Mid Colne Valley SSSI, and hedgerows, provide suitable habitat to support the bat assemblage present in the area.

2.4.42 High numbers of bats were recorded at Location one (the periphery of the woodland at the base of the sloped edging onto Broadwater Lake), Location two (the edge of

the ridge within the woodland to the west) and Location four (south-eastern corner of Korda Lake, north of Moorhall Road). Low to moderate bat activity was recorded at Location three (directly south of the Waterski Club at the edge of Broadwater Lake). This indicates that commuting routes along the woodland ridge on the western edge of the Mid-Colne Valley SSSI, the River Colne and associated vegetation, and the edge of the lake complex in this area, provide a network that supports high numbers of commuting bats. High levels of activity were recorded for common pipistrelles at Location one, which is on the ridge to west of Broadwater Lake. Noctule bats were the most abundant species, with moderate numbers of Leisler's bat recorded at Location one and lower numbers of both Leisler's and serotine recorded throughout.

2.4.43 High levels of *Nyctalus/Eptesicus* species bats were also recorded during the static monitoring surveys, which suggest bats were commuting at canopy height over lower ground at Location two to the east and being recorded by the understorey detector at Location one in the west. Peak night counts of these genera reached 370ppn at Location two and 119ppn at Location one.

2.4.44 Activity transects recorded high levels of *Myotis* species bat, Daubenton's bat and common and soprano pipistrelles commuting along the western boundary of the lake, where it meets the River Colne watercourse and adjacent mature semi-natural broadleaved woodland. Common and soprano pipistrelles were also recorded commuting along the lakes and the sand and gravel works in the east. The continuity of mature woodland habitats, which bound and cross Broadwater Lake, together with the standing water itself provide an extensive network of habitat features suitable for commuting bats.

2.4.45 The levels of bat activity and diverse species composition recorded in this area indicate that the extent and quality of commuting habitat in this area are of fundamental importance to bats commuting across the landscape in this area.

## CFA8 The Chalfonts and Amersham

### *Overview of bat species status in the vicinity of CFA8*

2.4.46 Habitats suitable for roosting, foraging and commuting bats in this area, including within land required for the construction of the Proposed Scheme, comprise mixed arable and pasture farmland bounded by hedgerows. The wider landscape includes further habitat suitable to support bats, including Hodgemoor Wood SSSI which contains large tracts of semi-natural broadleaved woodland, as well as several areas of ancient woodland including Pollards Wood, Bailey Wood and Hales Wood. Tree lined roads and hedgerows are abundant in the area, which are likely to function as habitat features for commuting bats. The River Misbourne, a spring fed chalk stream, runs through the area. The Proposed Scheme passes close to the villages of Chalfont St Peter and Chalfont St Giles as well as several isolated dwellings that provide potential roost sites for bats. The Proposed Scheme in this area runs in part through a bored tunnel and, where this is the case, the land required for the construction of the Proposed Scheme is confined to that at three vent shafts and associated satellite construction sites.

2.4.47 Field surveys recorded at least six species of bat<sup>4</sup> in this area:

- noctule (*Nyctalus noctula*);
- Daubenton's bat (*Myotis daubentonii*);
- Natterer's bat (*Myotis nattereri*);
- soprano pipistrelle (*Pipistrellus pygmaeus*);
- common pipistrelle (*Pipistrellus pipistrellus*); and,
- brown long-eared bat (*Plecotus auritus*).

2.4.48 There was a desk study record of a serotine bat, but this is not considered to be relevant to the assessment as it was an individual bat in flight noted approximately 1.2km from the route.

*Roosting (Trees)*

2.4.49 A total of 33 trees were subject to an initial assessment in line with the methods described in the Field Survey Methods and Standards (FSMS) document. These included ground based survey and a subsequent climbed inspection where appropriate resulting in the following:

- no confirmed bat roosts were identified;
- ten trees were assessed as having high potential to support roosting bats;
- 13 trees were assessed as having moderate potential to support roosting bats; and
- the remaining ten trees were assessed as having low or negligible potential; these trees were subsequently scoped out of further survey.

2.4.50 Of the 23 trees assessed that were assessed as having confirmed roosts or moderate or high potential to support roosting bats:

- a total of 21 trees were subject to tree climbing surveys and no bat roosts were identified;
- none were re-assessed as being of low or negligible potential;
- the remaining two trees were considered unsuitable for climbing surveys;
- five trees were subject to a total of five emergence surveys; and
- the remaining 18 trees were not subjected to further emergence surveys for reasons discussed in Section 1.4.

2.4.51 No back tracking surveys were undertaken in this area.

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<sup>4</sup> Certain species could only be identified to genus level on the basis of sound recordings; therefore, the figure of 12 relates to species which have been unambiguously confirmed in this area.

2.4.52 No tree roosts were identified in this area. A large proportion of trees identified as having potential to support bats were assessed through climbed inspections. As a result, the majority of roosts are likely to have been recorded where survey access was granted.

### *Roosting (building and structures)*

2.4.53 A total of eight buildings were subject to an initial assessment and further internal inspections, resulting in the following:

- two confirmed roosts were identified;
- one building was assessed as having high potential to support roosting bats;
- five buildings/structures were assessed as having moderate potential to support roosting bats; and
- no buildings were assessed as having low or negligible potential to support roosting bats.

2.4.54 Of the eight buildings with confirmed roosts or assessed as having high or moderate potential to support roosting bats:

- two were subject to a more detailed internal inspection. This resulted in the two buildings being confirmed as supporting roosting bats;
- detailed internal inspection was not possible on the remaining five buildings for reasons listed in Section 1.5;
- four buildings were subject to a total of four emergence surveys.

2.4.55 No backtracking surveys were undertaken within this study area. Details of confirmed roosts in buildings/structures in this area of the route are provided in Table 15.

Table 15: Confirmed bat roosts in buildings/structures in CFA8 The Chalfonts and Amersham

<b>Ecology survey code</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Building/structure type</b>	<b>Species confirmed utilising roost and (peak count)</b>	<b>Date of peak count and nature of survey</b>	<b>Roost type</b>	<b>Roost description</b>	<b>CFA</b>	<b>Distance from the Proposed Scheme</b>
020-BS2-041002	Lower Park House	SP 494 197	Residential	Brown long-eared bat	Internal building inspection, 4 July 2013	Feeding Perch	Open corrugated structure with skylights and wooden sarking. Identified through feeding remains present.	8	Within 450m of land required for the Proposed Scheme
020-BS3-034001	Ashwell's Farm	SP 500 193	Other (ore)	Brown long-eared bat	Emergence Survey, 23 May 2013	Transitional	Old Granary, now workshop. Pitched, tiled roof with two skylight windows on roof. Walls un-insulated weatherboards, generally all tightly fitted.	8	Within 450m of land required for the Proposed Scheme

### *Bat activity surveys*

2.4.56 No activity transects were undertaken in CFA8 due to limited extent of habitats suitable for bats within the above ground elements of the Proposed Scheme.

2.4.57 A total of six static detector surveys were undertaken within this area at two locations, both at Ashwell's Farm.

2.4.58 At least six species of bats were recorded during these surveys in this area, as follows:

- common pipistrelle;
- soprano pipistrelle;
- noctule;
- Leisler's bat;
- *Myotis* sp;
- Daubenton's bat; and
- Natterer's bat.

Table 16: Bat activity surveys conducted within CFA 8 The Chalfonts and Amersham

Ecology survey code	Transect/Static location	Number of surveys conducted	First survey date	Final survey date	Map Reference
020-BA2-056001	Ashwell's Farm 1	4	30 April 2012	22 July 2013	TQ 001 931
020-BA2-056-002	Ashwell's Farm 2	2	30 April 2012	8 May 2013	TQ 001 931

Table 17: Summary of static detector monitoring results for 020-BA2-034001 The Chalfonts and Amersham

Ecology survey code	Location	OS Grid	Description of habitat															
020-BA2-034001	Ashwell's Farm (CFA 8)	TQ 001, 931	Corner of field, chained to a holly and hawthorn tree - stands apart from other vegetation															
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Ep
Visit 1 - 30 April 2013	1	42	11	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0
Visit 2 - 01 May 13 to 03 May 2013	2	57	10	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Visit 3 - 01 June 2013- 09 June 2013 and 14 June 2013 - 24 June 2013	18	2269	236	0	4	0	10	0	0	0	0	42	0	0	0	1	0	1
Visit 4 - 12 July 2013-22 July 2013	10	0	0	0	2936	0	0	0	0	0	0	57	0	0	0	0	0	14
Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - <i>Nyctalus/Eptesicus</i> bat.																		

2.4.59 Low to moderate levels of common pipistrelle activity were recorded during April and June 2013. High levels of activity were observed during June 2013. Soprano pipistrelle activity was low during April and June 2013, with a notable peak in activity in June 2013. High bat activity (2,936ppn) of pipistrelle species were recorded during July 2013. *Myotis* species were recorded in low numbers during April and May 2013 and moderate numbers in June and July, with Daubenton's bats only being recorded in June 2013. No *Nyctalus/Eptesicus* activity was recorded during April or May 2013, and low levels of activity were noted in June and July. A single pass for a Leisler's bat was recorded during April and again in June 2013.

Table 18: Summary of static detector monitoring results for 020-BA2-034002 Chalfonts and Amersham

Ecology survey code	Location	OS Grid	Description of habitat
020-BA2-034002	Ashwell's Farm 2 (CFA8)	TQ 001 931	Adjacent rural Chesham Ln. and group of trees/spinney. Northern most holly tree within the hedge, next to farm gate

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring															
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es
Visit 1 - 30 April 2013- 31 April 13	2	165	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visit 2 - 01 May 2013 - 08 May 2013	7	1310	76	0	0	0	0	0	0	0	0	1	0	0	0	0	2

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.60 Common pipistrelle activity was moderate in April, but peaked during May 2013 when high numbers of ppn were recorded with a peak count of 1,310. Moderate levels of soprano pipistrelle activity were recorded in April 2013 and May 2013. No other bat species were observed during the April recording period. A peak count of one *Myotis* species pass and two *Nyctalus/ Eptesicus* passes were observed during May.

## Discussion

### Bat Assemblage

2.4.61 The bat assemblage in this area includes species that are common and widespread in Buckinghamshire. The static surveys at Ashwell's Farm identified common and soprano pipistrelles as being the most abundant species. *Myotis* species and *Nyctalus/Eptesicus* were also recorded, but in low numbers. Brown long-eared bats were not recorded during the surveys, although this is likely to be due to constraints in static detector methodology and the quiet call characteristics of the species. As such, their presence and subsequent abundance is likely to be under recorded.

2.4.62 Survey access was not possible around Bottom House Farm Lane, and access to the north-west of Amersham was not granted until late spring 2013. As a result, no data was collected at these locations. Although these areas may contain bat populations, the extent of habitat within the land required for construction of the Proposed Scheme is limited and the bat assemblage is likely to be similar to adjacent areas where surveys were possible. This is therefore not considered to be a significant constraint.

### Roosts

2.4.63 Two brown long-eared bat roosts were recorded during field surveys, one a transitional (day) roost and the other a feeding perch. Both roosts are considered to be of a low conservation status. The desk study did not identify the presence of any roosts within 100m of land required for the Proposed Scheme.

2.4.64 The bat assemblage largely consists of species that are considered to be common and widespread in the area. No rare or locally notable species were identified. The species composition and activity levels recorded through both desk study and field surveys indicate that the bat assemblage is likely to be representative of similar landscapes throughout the area.

### Foraging Habitat

2.4.65 Habitats used by foraging bats identified in this area include woodland, hedgerows, tree-lined roads and watercourses. The foraging activity of bats in these habitats was typically at low to moderate levels. Foraging activity of six species was recorded at Ashwell's Farm. These habitats are of value to local populations of foraging bats.

### Commuting Habitat

2.4.66 Bat commuting habitat identified in this area is similar to the woodland, hedgerows, tree-lined roads and watercourses identified as being used by foraging bats. Commuting activity of bats in these habitats was typically at low-moderate levels. Commuting activity of seven species was recorded at Ashwell's Farm. These habitats are of value to populations of bats commuting across the landscape in this area.

## CFAg Central Chilterns

### Overview of bat species status in the vicinity of CFA 9

2.4.67 Habitats present within this area suitable to support roosting, foraging and commuting bats consists of arable, pasture and isolated woods, some of which are wholly or partly ancient woodland. This is typical habitat for this part of the Chilterns Hills. The largest of the woodland blocks are Mantle's Wood, and Hedgemoor and Farthings Wood, which are located at or adjacent to the northern portal of the Chilterns Tunnel.

2.4.68 Field survey and desk top studies have found three common and widespread bat species in low numbers and two uncommon species (noctule and serotine bats) in very low numbers within this area, with relatively low levels of bat activity recorded overall. The bat assemblage within this area are as follows:

- noctule bat (*Nyctalus noctula*);
- serotine bat (*Eptesicus serotinus*);
- Natterer's bat (*Myotis nattereri*);
- Daubenton's bat (*Myotis daubentonii*);
- soprano pipistrelle (*Pipistrellus pygmaeus*);
- common pipistrelle (*Pipistrellus pipistrellus*) and;
- brown long-eared bat (*Plecotus auritus*).

2.4.69 Three common pipistrelle roosts were present in the north of this area. The bat assemblage consists of common and soprano pipistrelle, unidentified pipistrelle species, *Myotis* species, Daubenton's bats, noctule, serotine and unidentified large bat species. Desk study data also confirms the presence of low levels of commuting activity of brown long-eared bats and Natterer's bats. The greatest bat activity was recorded in association with the three roosts, located in the north of the area, with less activity and fewer species recorded in the south of the area.

### Roosting (Trees)

2.4.70 A total of 49 trees were subject to an initial assessment in-line with the methods described in the Field Survey Methods and Standards (FSMS) document. These included ground based survey and subsequent climbing inspection where appropriate.

2.4.71 Of the 49 trees subjected to the initial assessment:

- no bat roosts were identified;
- two trees were assessed as having high potential to support roosting bats;
- 24 trees were assessed as having moderate potential to support roosting bats; and
- the remaining 23 trees were assessed as having low or negligible potential; these trees were subsequently scoped out of further survey.

2.4.72 Of the 26 trees assessed as having moderate or high potential to support roosting bats:

- a total of three trees were subject to tree climbing surveys;
- as result, no confirmed bat roosts were identified and none of the trees were re-assessed as being of low or negligible potential;
- the remaining 23 trees could not be climbed due to the constraints listed in section 1.4.1 and 1.4.2;
- two trees were subjected to two emergence surveys;
- the remaining trees were not surveyed due to access and time constraints.

2.4.73 No back tracking surveys were carried out at this area.

2.4.74 Desk study records identified no tree roosts within this area, despite the ancient and semi-natural woodland habitat present, and indicated that low levels of bat activity have been recorded within this area previously.

### *Roosting (building and structures)*

2.4.75 A total of nine buildings were subject to an initial assessment and further internal inspections resulting in the following:

- no confirmed roosts were identified within buildings during initial assessments
- two buildings/structures were assessed as having high potential to support roosting bats;
- four buildings/structures were assessed as having moderate potential to support roosting bats; and
- the remaining three buildings were assessed as having low or negligible potential to support roosting bats; these trees were subsequently scoped out of further survey.

2.4.76 Of the seven buildings assessed as having roosts or high or moderate potential to support roosting bats:

- three were subject to a more detailed internal inspection. This resulted in no roosts being identified and none of the buildings being downgraded to low or negligible potential to support roosting bats; and
- four buildings were subject to a total of six emergence surveys which resulted in three buildings being confirmed as supporting roosts. As discussed in the constraints section; 1.4.1-1.4.6, not all features were subject to a full set of emergence surveys due to intermittent access to sites and adverse weather conditions affect the survey schedule.

2.4.77 No back tracking surveys were undertaken within this area.

2.4.78 Details of confirmed roosts in buildings/structures in this area of the route are provided in Table 19.

Table 19 Confirmed bat roosts in buildings/structures in CFA 9

<b>Ecology survey code</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Building/structure type</b>	<b>Species confirmed utilising roost and (peak count)</b>	<b>Date of peak count and nature of survey</b>	<b>Roost type</b>	<b>Roost description</b>	<b>CFA</b>	<b>Approximate Distance from the Proposed Scheme</b>
020-BS3-047001	Mulberry Park Hill	SP 490 202	Residential	<i>Common pipistrelle</i> (1)	Emergence survey – 26 June 2013	Daytime/transitional	Converted barn structure.	9	Within the Proposed Scheme
020-BS2-047003	Mulberry Park Hill	SP 490 202	Residential	<i>Common pipistrelle</i> (50)	Emergence survey – 26 June 2013	Maternity	Large manor house Residential building- several roof voids with good bat potential.	9	Within the Proposed Scheme
020-BS2-047002	Mulberry Park Hill	SP 490 202	Garage	<i>Common pipistrelle</i> (2)	Emergence survey – 26 June 2013	Daytime/transitional	Outhouse for swimming pool.	9	Within the Proposed Scheme

### Bat activity surveys

2.4.79 The predominant species recorded from activity transect and static monitoring surveys was common pipistrelle, along with low numbers of soprano pipistrelle, pipistrelle species, *Myotis* species, Daubenton's bat, noctule and serotine. Desk studies further showed the presence of a Natterer's bat commuting at Wendover (within 540m of the Land required for construction of the Proposed Scheme) and Daubenton's bat foraging at Weston Turville Reservoir (which is within 1.4km of the Land required for construction of the Proposed Scheme).

2.4.80 The total bat assemblage for this area identified through a combination of desk top studies and field surveys is as follows:

- noctule bat (*Nyctalus noctula*);
- serotine bat (*Eptesicus serotinus*);
- Natterer's bat (*Myotis nattereri*);
- Daubenton's bat (*Myotis daubentonii*);
- common pipistrelle (*Pipistrellus pipistrellus*); and
- soprano pipistrelle (*Pipistrellus pygmaeus*).

Table 20 Bat activity surveys conducted within CFA 9 inclusive

Ecology survey code	Transect location	Number of surveys conducted	First survey date	Final survey date	CFA	Map Reference
020-BA1-043-045-002	Driven transect CFA9 (starting at Broome Farm the end point is Spring field Farm, via Leather Lane, where Potter's Row turns in to King's Lane)	4	25 April 2013	27 July 2013	9	Start SU 923 993, finish SU 932 991
020-BA1-044-001	Activity transect CFA9 (starting at Mantle's Wood ending near Keepers Wood)	4	22 April 2013	22 July 2013	9	Start SU 923 993, finish SU 932 991
020-BA2-047001	Mulberry Park Hill	2	01 May 2013	24 May 2013	9	SP900 024
020-BA2-044001	Mantle's Farm	3	07 May 2013	17 July 2013	9	SP 922 000

Table 21 Bat activity transect survey results - Transect 020-BA1-045(-043)-001

Ecology survey code	Transect location			Description of habitats covered by transect																	
Visit number and date	Weather conditions			Total species passes during transect survey																	
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (0-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Es
Visit 1 Dusk 17 April 2013	14	8	0	7	24																
Visit 2: Dusk 22 May 2013	9.9 (start)- end 7.6	0	0	2	17	1															
Visit 2: Dawn 23 May 2013	5.6 (start)- 5.1 (ended)	0	0	5	5																
Visit 3: Dusk 11 June 2013	15.6	2	0	2	12																
Visit 3: Dawn 12 June 2013	13.8	3	0	8	6																
Visit 4: Dusk 22 July 2013	27	5	0	1	11																2
Visit 4: Dawn 23 July 2013	18	8	2-5	2	8																1

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

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Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

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2.4.81 The dominant species observed during activity transects was common pipistrelle, with peak counts occurring in April and May (24 and 17ppn respectively), which was recorded across the transect route. With the exception of one soprano pipistrelle pass in May, and three large bat passes in July. The only regularly occurring species, albeit at low density, was common pipistrelle.

Table 22 Driven activity transect survey results - Transect 020-BA1-045(-043)-002

Ecology survey code	Transect location				Description of habitats covered by transect																
Visit number and date	Weather conditions				Total species passes during transect survey and principle behaviour																
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (0-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Es
Visit 1 Dusk 17 April 2013	14	8	0	7	24																
Visit 1 Dawn 18 April 2013 - No records- survey cancelled	7	8	3	9																	
Visit 2: Dusk 22 May 2013- No data	9	7	1	6																	
Visit 3: Dusk 17 June 2013	15°C	8	2	4	25											2		5			
Visit 4: Dawn 24 June 2013	12°C	8	1	1	4	1															

<b>Ecology survey code</b>	<b>Transect location</b>				<b>Description of habitats covered by transect</b>																
<b>Visit number and date</b>	<b>Weather conditions</b>				<b>Total species passes during transect survey and principle behaviour</b>																
	<b>Temp (°C)</b>	<b>Cloud (0-8)</b>	<b>Rain (0-5)</b>	<b>Wind (0-12)</b>	<b>Pp</b>	<b>Ppy</b>	<b>Pn</b>	<b>P sp.</b>	<b>Mb</b>	<b>Md</b>	<b>Mn</b>	<b>Mm</b>	<b>Mbr</b>	<b>Mm /Mb</b>	<b>M sp.</b>	<b>Pa</b>	<b>Bb</b>	<b>Nn</b>	<b>NI</b>	<b>Es</b>	<b>Ny/ Es</b>
Visit : Dusk 23 July 2013	20°C	4	0	1	27										1						
Visit : Dawn 24 July 2013	20°C	4	0	1	5	1															

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

2.4.82 Very low levels of *Myotis* and noctule activity were recorded on the driven transect, with only 5ppn for noctules and 2ppn, and 1ppn for *Myotis* in June and July respectively. There was consistently low activity of common pipistrelle bats across the months (peak count of 27ppn in July). Occasional soprano pipistrelles passes were recorded, with one pass in the dawn transects undertaken in both June and July. Activity was concentrated around Hyde Lane and King's Lane.

Appendix EC-003-002

Table 23 Summary of static detector monitoring results at 020-BA2-048001

Ecology survey code	Location	OS Grid				Description of habitat												
020-BA2-048001	Mulberry Park Hill	SP900 024				Large garden, well-kept grass with large trees												
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Ep
April 2013- No Data Recorded	7																	
01 May 2013 to 07 May 2013	6	201	3		22							2			1		1	
24 May 2013 to 30 May 2013	6	262	3									2			6			
June 2013- No Data- access refused	0																	
17 July 2013 -23 July 2013	6	206	1		20							1			1			

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.83 Moderate numbers of common pipistrelles calls were recorded at this location. The highest peak count was noted during late May (262ppn). Similar levels of activity for this species were recorded in May and July. Very low levels of *Myotis*, serotine and noctule calls were detected at this site, with only 1-2ppn recorded in May and July for *Myotis*, and single serotine and noctule passes in May. A peak count of 6ppn for noctules was recorded in late May.

Table 24 Summary of static detector monitoring results for 020-BA2-044001

Ecology survey code	Location	OS Grid		Description of habitat										
020-BA2-044001	Mantle's Farm	SP 922 000		Grassland and hedgerow										
Date (night monitoring commenced to	Number of	Species peak night count during monthly monitoring												

night monitoring ceased)	nights detector deployed	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Ep
07 May 2013 to 13 May 2013 -No records	7																	
17 May 2013 to 22 May 2013-No records	7																	
11 June 2013 to 18 June 2013-No records	7																	
17 July 2013 to 24 July 2013	7	206	1		20							2			1			

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.84 No bats were recorded during the first three recording periods in May and June 2013. Moderate levels of common pipistrelle activity were recorded in July, along with low numbers of *Myotis* sp., noctule and soprano pipistrelle with peak passes per night of 2,1 and 2ppn respectively.

## Discussion

### Bat Assemblage

2.4.85 From field surveys, at least five bat species have been recorded within this area. These comprise three common species, namely common and soprano pipistrelles and Daubenton's bats, and two uncommon species, namely noctule and serotine bats. Bats unidentified to species level comprised pipistrelle species, *Myotis* species, and unidentified large bats (*Eptesicus/Nyctalus*).

2.4.86 Desk top studies confirm the presence of two further bat species, namely brown long-eared bat and Natterer's bat.

### Roosts

2.4.87 One maternity roost of common pipistrelle containing approximately 50 bats and two day/transitional roosts with one to three individuals were identified at Mulberry Park Hill during field surveys. This site falls within the land required for construction of the Proposed Scheme and the buildings will be demolished, resulting in the loss of all three roosts.

2.4.88 No tree roosts were identified through desktop or field surveys, although trees with potential to support roosting bats were identified.

### Foraging Habitat

2.4.89 The landscape in this area comprises arable and pasture farmland, and isolated ancient and semi-natural woodland, with intact hedgerows and multiple tree-lined roads.

2.4.90 Low levels of bat foraging activity were noted in several locations along Chalk Lane and Keeper's Lane, Hyde Lane and near Sibley's Coppice. The dominant species recorded at these locations was common pipistrelle. Very low levels of foraging activity were detected around Mantle's Wood, with each transect detecting less than 10 bat ppn, and only the occasional common pipistrelle. Parts of Mantle's Wood are within land required for the construction of the Proposed Scheme. Low activity from common pipistrelles was recorded at this site along with very low levels for soprano pipistrelle, noctule and *Myotis* species. The highest numbers of bat passes were recorded near the roosts identified at Mulberry Park Hill.

### Commuting Habitat

2.4.91 The hedgerow network throughout this area is well established and has good connectivity to other habitats that may support bats, but which were not surveyed due to limited access. Together with tree-lined roads, hedgerows provide a network for commuting bats.

2.4.92 During field surveys commuting activity was prevalent near Mulberry Park Farm. The common pipistrelle commuting activity is likely to be associated with the three roosts recorded at the site. Low levels of commuting activity, including that for *Myotis*, serotine and noctule bats, were recorded from transect surveys carried out to the south near Mantle's Wood. This area contains linear strips of woodland and hedgerow that provide suitable bat commuting habitat. The results of driven transect

undertaken to the south of South Heath indicate low levels of activity for common and soprano pipistrelle, noctule bats and *Myotis* species. The higher speeds at which driven transects are undertaken compared to walked surveys means that bat passes recorded during driven transects can become distorted and thus harder to detect accurately. This is accounted for when directly comparing the results from the two survey methods.

### **CFA10 Dunsmore, Wendover and Halton**

#### *Overview of bat species status in the vicinity of CFA 10*

2.4.93 Suitable habitat for roosting, foraging and commuting bats within and adjacent to the land required for the construction of Proposed Scheme was present in this area. This includes arable, pasture, intact hedgerows, tree-lined roads, orchards, lowland calcareous grassland and semi-natural broadleaved woodland. Farm buildings in the south and residential properties in Wendover, situated adjacent to the route in the north of the area, provide potential roosting sites for bats.

2.4.94 The bat assemblage in this area comprises at least seven species identified through field surveys and desk studies. These are as follows:

- Natusius' pipistrelle (*Pipistrellus nathusii*);
- whiskered bat (*Myotis mystacinus*);
- noctule (*Nyctalus noctula*);
- serotine (*Eptesicus serotinus*)
- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*); and
- brown long-eared bat (*Plecotus auritus*).
- *Nyctalus/Eptesicus* species.
- *Myotis* species.

2.4.95 Habitats within this area support foraging and roosting bats including two rare species; Natusius' pipistrelle and whiskered bat and two uncommon species; noctules and serotines. Site access was restricted within this area however survey data and desk studies indicate bat activity was more prevalent within the northern section of this area with five roosts and moderate levels of bat activity recorded at sites north of Ellesborough Road.

#### *Roosts within trees*

2.4.96 A total of 101 trees were subject to an initial assessment in line with the methods described in the Field Survey Methods and Standards (FSMS) document. These included ground based survey and a subsequent climbed inspection where appropriate. Of the 101 trees were subject to an initial assessment:

- No confirmed tree roosts were identified in the initial assessment (four roosts

were later identified in emergence surveys);

- 18 trees were assessed as having high potential to support roosting bats;
- 36 trees had features assessed as having moderate potential to support roosting bats; and,
- 47 trees were assessed as having low or negligible potential; these trees were subsequently scoped out of further survey.

2.4.97 Of the 54 trees assessed as having moderate or high potential to support roosting bats:

- 19 were subject to climbing surveys;
- as a result, no trees were re-assessed as having of low or negligible potential to support roosting bats;
- the remaining trees were not climbed owing to the constraints listed in sections 1.4.1 and 1.4.2.

2.4.98 Six trees of the 19 trees climbed were subject to a total of six emergence surveys resulting in four confirmed roosts being identified. The remaining 12 trees could not be climbed due to access restrictions at some sites and trees which were not safe to be climbed as discussed in sections 1.4.1 to 1.4.5 in the constraints and limitations section.

2.4.99 No backtracking surveys were undertaken in this area.

2.4.100 Details of confirmed roosts in trees in this area of the route are provided in Table 25.

Table 25 Confirmed tree roosts within CFA 10

<b>Ecology survey code</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Tree species</b>	<b>Species confirmed as utilising roost and (peak count)</b>	<b>Date of peak count and nature of survey</b>	<b>Roost type</b>	<b>Roost description</b>	<b>CFA</b>	<b>Approximate distance from the Proposed Scheme</b>
020-BT3-056001	Wellwick Farm	SP 850 086	Pedunculate oak	Common pipistrelle (3)	5 June 2013, Emergence survey	Day	Callus roll in an oak tree which was located in a well-established hedge.	10	Within land required for the construction of the Proposed Scheme
020-BT3-056002	The Orchard	SP 847 090	Cherry species	Noctule (1)	10 October 2012, Emergence survey	Transitional	Woodpecker hole in a tree located in the hedgerow surrounding an old unmaintained orchard.	10	Within land required for the construction of the Proposed Scheme
020-BT3-056004	The Orchard	SP 847 090	Ash	Common pipistrelle (1)	11 October 2012, Emergence survey	Transitional	Large ash tree with a crevice, the tree was located in the hedgerow on the perimeter of an old orchard.	10	Within land required for the construction of the Proposed Scheme
020-BT3-056003	The Orchard	SP 846 090	Cherry species	Common pipistrelle (1)	12 October 2012, Emergence survey	Transitional	Tree crevice in a <i>Prunus</i> sp. within The Orchard.	10	Within land required for the construction of the Proposed Scheme

### *Roosts within building and structures*

2.4.101 A total of 24 buildings were subject to an initial assessment and further internal inspections, resulting in the following:

- five buildings were confirmed to support a total of six bat roosts;
- four buildings/structures were assessed as having high potential to support roosting bats;
- seven buildings/structures were assessed as having moderate potential to support roosting bats; and
- eight buildings were assessed as having low or negligible potential for roosting bats. These were subsequently scoped out of further survey.

2.4.102 Of the 16 buildings confirmed as having roosts or assessed as having high or moderate potential to support roosting bats:

- five buildings were subject to a more detailed internal inspection, this resulted in five buildings being confirmed as supporting six roosts;
- no buildings were reassessed as low or negligible potential to support roosting bats;
- Four buildings/structures with roosts were subject to a total of 13 emergence surveys, which confirmed one of the roosts described above; and
- Of the 16 buildings the remaining 12 were also not subject to further emergence surveys due to land owner restrictions (as discussed in the constraints Section 1.5).

2.4.103 No backtracking surveys were undertaken within this area.

2.4.104 The six confirmed roosts were identified using a mixture of internal building inspections and emergence surveys. They comprised one soprano pipistrelle, four brown long-eared and one whiskered bat roost (identified from dropping DNA). Details of confirmed roosts in buildings/structures in this area are provided in Table 34.

Table 26 Confirmed bat roosts in buildings/structures in CFA 10

<b>Ecology survey code</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Building/structure type</b>	<b>Species confirmed utilising roost and (peak count)</b>	<b>Date of peak count and nature of survey</b>	<b>Roost type</b>	<b>Roost description</b>	<b>CFA</b>	<b>Approximate distance from the Proposed Scheme</b>
020-BS2-051001	Hartley Farm	SP 880 057	Residential	Brown long-eared bat (droppings)	Internal building inspection 26 March 2013	Day/Night	Crevice behind timber at gables, gap in soffit. Scattered droppings throughout. Small concentrated pile near south east end.	10	Within 25m of land required for the Proposed Scheme
020-BS2-051002	Hartley Farm	SP 880 057	Barn	Brown long-eared bat (droppings)	Internal building inspection 26 March 2013	Day/Night	Crevices under corrugated roof and within walls. Scattered droppings.	10	Within 25m of land required for the Proposed Scheme
020-BS2-053001	Grove Farm	SP 869 069	Residential	Brown long-eared bat (estimated 10-15 bats from droppings)	Internal building inspection 20 March 2013	Maternity	Gaps at gable end, apex, behind beam near Western chimney, under ridge tiles, behind final rafter, under soffit box and under lead flashing. Several areas of loose felt.	10	Within 25m of land required for the Proposed Scheme
020-BS3-053001	Grove Farm	SP 869 069	Residential	Soprano pipistrelle (1)	Emergence survey 06 June 2013	Day/Summer	Gap at the end of the guttering/ soffit boards on the north-west aspect.	10	Within 25m of land required for the Proposed Scheme
020-BS2-054006	Ellesborough road	SP 865 076	Residential	Brown long-eared bat (around 30 droppings)	Internal building inspection 13 February 2013	Day	Bitumen felt roof, insulation between joists. Crevice behind loose bitumen felt. Crevices between beams and ridge boards throughout.	10	Within of land required for the Proposed Scheme
020-BS2-054002	Residential building on Ellesborough Road	SP 865 090	Residential	Whiskered bat (5-10 droppings)	Internal building inspection 13 March 2013	Transitional	Crevices between beams and ridge boards throughout.	10	Within 20m of land required for the Proposed Scheme

### Bat activity surveys

2.4.105 The following bat species were recorded during the range of bat activity surveys carried out in this area:

- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*);
- Natusius' pipistrelle (*Pipistrellus nathusii*);
- *Myotis* species;
- serotine bat (*Eptesicus serotinus*);
- noctule bat (*Nyctalus noctula*); and
- *Nyctalus/Eptesicus* species.

Table 27 Bat activity surveys conducted within CFA 10

Ecology survey code	Transect location	Number of surveys conducted	First survey date	Final survey date	CFA	Map Reference
020-BA1-050001	Walked Transect Strawberry Hill Farm and Hartley Farm, Wendover	8	24 April 2013	9 July 2013	10	Start-SP 887 053, End-SP 885 043
020-BA1-050002	Driven Transect Hartley Farm, Strawberry Hill Farm finishing at Cottage Farm on Leather Lane	8	24 April 2013	9 July 2013	10	Start-SP 890 031, End- SP875 058
020-BA2-050001	Strawberry Hill Farm	3	17 April 2013	10 June 2013	10	SP 888 042
020-BA2-051001	Hartley Farm	4	25 April 2013	22 July 2013	10	SP 881 055
020-BA2-055001	Wellwick Farm	4	24 April 2013	9 July 2013	10	SP 853 085

Table 28 Bat activity transect survey results - Transect 020-BA1-050-001-Strawberry Hill Farm and Hartley Farm

<b>Ecology survey code</b>	<b>Transect location</b>				<b>Description of habitats covered by transect</b>																
020-BA1-050001	Strawberry Hill Farm and Hartley Farm, Wendover				The transect covers mixed farmland predominantly consisting of arable fields, semi-improved grassland, species rich hedgerows with trees and areas of semi-natural broadleaved woodland.																
<b>Visit number and date</b>	<b>Weather conditions</b>				<b>Total species passes during transect survey principle behaviour</b>																
	<b>Temp (°C)</b>	<b>Cloud (0-8)</b>	<b>Rain (0-5)</b>	<b>Wind (0-12)</b>	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Es
Visit 1: Dusk 24 April 2013	15	8	1	1	4																
Visit 2: Dawn 25 April 2013	12	8	0	1																	
Visit 3: Dusk 23 May 2013	6-7	4	0	3																	
Visit 4: Dawn 24 May 2013	4-6	0	0	5	3																
Visit 5: Dusk 12 June 2013	14	8	2	6	6																
Visit 6: Dawn 13 June 2013	12.5	7	0	3-5	6			1													
Visit 7: Dusk 8 July 2013	17	4	0	0	71	55														1	
Visit 8: Dawn 9 July 2013	11 – 15	0	0	2-3	72																

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

2.4.106 Common pipistrelles were observed during every month and in six of the eight visits. Activity levels were low during April, May and June 2013. The peak activity for this species was observed in July 2013 when moderate activity levels were recorded with a peak count of 72ppn on the final dawn visit. Soprano pipistrelles were only recorded on one of the eight visits; this was the dusk survey in July 2013 when a peak of 55ppn was recorded. A single, unidentified pipistrelle bat species was recorded on visit six in June 2013. On the dusk visit in July 2013 an individual serotine bat was observed.

2.4.107 Jones' Hill Wood to the south-west of Strawberry Hill Farm was identified as a common pipistrelle foraging area. This habitat was also used by commuting common pipistrelle bats during the dusk survey in April 2013. Common and soprano pipistrelles were recorded foraging along a hedgerow to the north of Strawberry Hill Farm that lies 200m west and parallel to King's Lane. Common pipistrelles were also observed foraging around the trees that line the junction of King's Lane and Chesham Lane. The woodland to the west of this junction, north of Chesham Lane, was identified as an important foraging and commuting habitat for both common and soprano pipistrelle. The buildings at Hartley Farm and the surrounding trees were also used for foraging by both these species. The trees lining Rocky Lane were used as a commuting corridor by three species of bat on the dusk survey in July 2013, including common pipistrelle, soprano pipistrelle and a serotine bat. Common and soprano pipistrelle were also observed commuting and foraging along the wooded area either side of the A413, north-west of Rocky Lane.

Table 29: Bat activity driven transect survey results – transect 020-BA1-050-002-Strawberry Hill Farm and Hartley Farm

Ecology survey code	Transect location	Description of habitats covered by transect
020-BA1-050-002	Strawberry Hill Farm and Hartley Farm, Wendover	The transect covers mixed farmland predominantly consisting of arable fields, semi-improved grassland, species rich hedgerows with trees and areas of semi-natural broadleaved woodland.

Visit number and date	Weather conditions				Total species passes during transect survey and principle behaviour																	
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (0-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/ Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Es	
Visit 1: 18 April 2013 dusk	8	0	0	3	67	148		21							11			3		1	13	
Visit 2: 26 April 2013 dusk	7-3	1	0	2																		
Visit 3: 17 May 2013 dusk	8	8	0	2	73	1		7							2							
Visit 4: 18 May 2013	Cancelled due to weather																					
Visit 5: 18 June 2013 dusk	16	4	0	0	45																1	
Visit 7: 25 June 2013 dusk	14	2	1	0	169	2		6														
Visit 9: 24 July 2013 dusk	19	4	0	2																		
Visit 10: 25 July 2013	Cancelled due to weather																					

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

Ecology survey code	Transect location				Description of habitats covered by transect																
Visit number and date	Weather conditions				Total species passes during transect survey and principle behaviour																
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (0-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Es
Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.																					
Wind speed score of 0-12 against Beaufort scale where 0 = calm, 1 = light breeze, 2 = Moderate breeze, 3 = strong breeze, 4 = High wind, 5 = Strong gale, 6 = Hurricane																					

2.4.108 The driven transect picked up low levels of activity across the route, with the assemblage consisting largely of common and soprano pipistrelles. Both these species were recorded in low to moderate numbers with peak counts of 169ppn for common pipistrelle in June and of 148ppn for soprano pipistrelle in April 2013. *Myotis* species, noctules and unidentified *Nyctalus/Eptesicus* were recorded in low numbers with peak counts of 11, 3 and 13ppn respectively.

Table 30: Summary of static detector monitoring results for 020-BA2-050001-Strawberry Hill Farm

Ecology survey code	Location	OS Grid				Description of habitat													
020-BA2-050001	Strawberry Hill Farm	SP 888 042				Arable field bordered by hedgerow													
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring																
			Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Ep
17 April 2013– 22 April 2013		6		1									1						
7 May 2013– 13 May 2013		7	9			1													
4 June 2013– 10 June 2013		7	68	3		5							3					1	

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp. - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

2.4.109 Common pipistrelles were recorded during May and June 2013 in low to moderate numbers, with a peak count of 68ppn recorded in June. Low levels of soprano pipistrelle activity were noted during April and June 2013. Low numbers of unidentified pipistrelle species were also recorded in May and June 2013. *Myotis* sp. bats were recorded in low numbers during April and June 2013, whilst a single unidentified serotine was recorded in June 2013.

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Table 31: Summary of static detector monitoring results for 020-BA2-051001-Hartley Farm

Ecology survey code	Location	OS Grid				Description of habitat												
020-BA2-051001	Hartley Farm	SP 881 055				Arable field with mixed hedgerows and trees (small copse)												
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring															
			Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es
25 April 2013– 30 April 2013		6	4															
17 May 2013– 27 May 2013		11	38	1									4					
11 June 2013– 17 June 2013		7	8	2	1								1					
16 July 2013– 22 July 2013		7																

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

2.4.110 Common pipistrelles were recorded in low numbers throughout surveys from April to July 2013, with a peak count of 38ppn recorded in May 2013. Soprano pipistrelle activity was limited to a single pass in May 2013 and two ppn in June 2013. A single Nathusius' pipistrelle was recorded during June 2013 on two separate nights. *Myotis* sp. bat were recorded in low numbers during May and June 2013. No bat passes were recorded during July 2013 at this location indicating low levels of activity during this period.

Table 32: Summary of static detector monitoring results for 020-BA2-055001-Wellwick Farm

Ecology survey code	Location	OS Grid				Description of habitat													
020-BA2-055001	Wellwick Farm	SP 853 084				Arable field bordered by hedgerow													
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring																
			Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Ep
24 April 2013 – 29 April 2013		6	9	3		3													
22 May 2013 – 27 May 2013 (recording malfunction)		6																	
25 June 2013 – 01 July 2013		7	216	20		1												1	1
02 July 2013 – 09 July 2013		8	531	40	2								3			1		1	2

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Natusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.111 High levels of activity were recorded for common pipistrelle during June and July 2013 with peak activity occurring in July with 531ppn. Low levels of activity were recorded for this species during April 2013. Low to moderate numbers of soprano pipistrelle were logged during June and July, with July recording the most activity. Only low numbers of this species were recorded during April 2013. Unidentified pipistrelle species were also noted in low quantities during April and June 2013; in July 2013 the rare Natusius' pipistrelle was also recorded. Serotine and undetermined *Nyctalus/ Eptesicus* bats were recorded in small numbers in June and July 2013. *Myotis* species and a single noctule bat were recorded during July 2013.

## Discussion

### Bat Assemblage

2.4.112 From field surveys and desktop studies, seven species of bat have been confirmed within CFA10. Seven species of bat were identified through field surveys alone. These included two rare species, *Nathusius' pipistrelle* and *whiskered bat*; two uncommon species, *noctule* and *serotine bats*; and three common species, *common* and *soprano pipistrelle*, and *brown long-eared bat*. In addition, unidentified *Myotis* and *Nyctalus/Eptesicus* species were recorded. Desk study data from Buckinghamshire Biological Records Centre (BBRC) identified further records of *Leisler's bat*, as well as the common *Daubenton's* and *Natterer's* bats.

2.4.113 In total, this assemblage contains two species classified as rare (*Nathusius' pipistrelle* and *whiskered bat*), one scarce species (*Leisler's*) and two uncommon species (*serotine* and *noctule*). These species are classified as such because of their smaller or declining population sizes and/or restricted ranges.

2.4.114 Greater species richness was recorded in the north of this area, compared to the south. This may be associated with the greater habitat complexity noted in the north of this area compared to the south, and that included woodlands, hedgerows and water bodies. Rarer species (*Nathusius' pipistrelle* and *whiskered*) and uncommon species (*serotines*) were recorded in higher numbers within the north of this area.

### Roosts

2.4.115 Four tree roosts and six building roosts were identified from field surveys within the survey area. These roosts include a *whiskered bat* roost and a *brown long-eared* roost at Ellesborough Road, both of which are located within or adjacent to (within 50m) land required for construction of the Proposed Scheme. Two *brown long-eared* bat roosts were found at Hartley Farm, located 15m from land required for construction of the Proposed Scheme. One further *brown long-eared* roost and a *soprano pipistrelle* roost were found at Grove Farm, and these are located within 25m of land required for construction of the Proposed Scheme. A *noctule* and two *common pipistrelle* tree roosts were located in The Orchard at Nash Lee Road; this site is partially within land required for the construction of the Proposed Scheme with the farthest roost located only 80m from the land required for the construction of the Proposed Scheme. A further *common pipistrelle* tree roost was located within Wellwick Farm, located 50m from land required for construction of the Proposed Scheme.

2.4.116 The most pertinent desk study records include a *brown long-eared* bat roost in a residential property on Baccombe Lane to the south of Wendover, within 20m of land required for the construction of the Proposed Scheme. There is a record for a further *brown long-eared* roost in a property on Rocky Lane to the east of the A413, 30m from land required for the construction of the Proposed Scheme. There are also records for a *brown long-eared* and a *pipistrelle* bat roost at a property on Nash Lee Lane, west of the existing railway line. This is situated 50m from land required for the construction of the Proposed Scheme. Several other records for *brown long-eared* roosts also exist between 150m and 1km from land required for the construction of the Proposed Scheme in this area.

2.4.117 Brown long-eared and pipistrelle bats are considered to have stable and unrestricted populations, and roosts of these species of a small size in Buckinghamshire are considered common.

2.4.118 In the northern part of the area, where habitats were typically more complex compared to the landscape in the south, more diverse bat assemblages were recorded including rarer species. These comprised a whiskered bat maternity roost and a noctule transitory roost which are species with more restricted distributions and or smaller/declining populations.

### *Foraging Habitat*

2.4.119 The landscape in this area comprises largely agricultural fields, orchards, calcareous grasslands and semi-natural broadleaved woodlands, with intact hedgerows and multiple tree lined roads. Watercourses, providing foraging habitat, are present in the north of the area. The Stoke Brook and its tributaries south of Stoke Mandeville are adjacent to land required for the construction of the Proposed Scheme and are likely to be used by the bat roosts found directly to the south of these watercourses.

2.4.120 During the driven and walked activity surveys, foraging activity was noted at several locations along Rocky Lane and King's Lane leading into Bowood Lane. Foraging was recorded in low levels between Leather Lane and Rocky Lane in the vicinity of Strawberry Hill Farm and Hartley Farm. Common and soprano pipistrelles were the dominant species recorded during these driven and walked transects to the south of this area.

2.4.121 Driven activity transects were undertaken as walked transects were non-continuous in this area due to access restrictions, as discussed in section 1.6.2. In particular, driven activity transects were undertaken in order to supplement data for the southern section of this area.

2.4.122 Despite the suitable habitat and well established hedgerows in the southern section of the area, foraging and commuting numbers from static monitoring devices were low compared to activity and foraging records in the north of the area at Wellwick Farm. The bat assemblage to the north of this area comprised moderate numbers of common species (common pipistrelle), and low numbers of rare species (*Nathusius' pipistrelle*) and uncommon (noctule and serotine) as well as *Myotis* species. Higher levels of activity recorded in the north also indicate that habitats here are important in supporting foraging communities of rarer species and contribute to the overall ecological value of this area.

### *Commuting Habitat*

2.4.123 The hedgerow network throughout this area is well established and connected, and, in combination with tree-lined roads, provides an extensive network for commuting bats.

2.4.124 Commuting activity was more prevalent within the northern part of the area, with comparatively higher levels of pipistrelle activity recorded near Wellwick Farm than those recorded in the south at Strawberry Hill or Hartley Farm. Fewer records of *Myotis* and larger bats were recorded at Strawberry Hill and Hartley Farm compared

to records near Wellwick Farm. The connected hedgerows and their proximity to Baccombe and Coombe Hills SSSI south of Ellesborough Road provides important commuting habitat between roosts and foraging habitat in the northern section of this area.

## CFA11 Stoke Mandeville and Aylesbury

### *Overview of bat species status in the vicinity of CFA 11*

2.4.125 Habitat suitable to support roosting, foraging and commuting bats within and adjacent to the Proposed Scheme in this area consists of farmland bounded by hedgerows and woodland. Lowland mixed deciduous woodland and pasture is present to the south-west of Aylesbury. A number of potential commuting and foraging features were identified from Phase 1 Habitat Survey data and aerial photography. This includes several hedgerows at Stoke Brook to the south of Aylesbury, hedgerows and tree-lines on the Hartwell Estate, and hedgerows, linear strips of broadleaved woodland and the River Thame, all within mixed use farmland, at Putlowes Farm to the north of Aylesbury.

2.4.126 Bat activity levels were relatively consistent across the area with particularly high levels of activity recorded at Hartwell House for Myotis species, common and soprano pipistrelles. Furthermore, moderate to high activity of noctules and serotines were recorded, both of which are classified as uncommon species within the UK. Two rare bat species (barbastelle bats and Natusius' pipistrelle) were also recorded in low numbers at this site. High levels of activity were also recorded from 2013 data at Putlowes, Fleet Marston Spinney and Moat Farm. Common pipistrelles were recorded in high numbers and soprano pipistrelles and Myotis species were recorded in moderate numbers.

2.4.127 Field surveys identified the presence of two rare bat species (namely barbastelle bats and Natusius' pipistrelles), two uncommon species (noctule and serotine bats), one scarce species (Leisler's bat) and three common species, namely common and soprano pipistrelles and brown long-eared bats. Myotis species, unidentified to species level, were also recorded.

2.4.128 Desk studies confirmed the presence of four Myotis species, two of which are rare (Brandt's bat and whiskered bat), two of which are common (Natterer's bat and Daubenton's bat).

2.4.129 Overall, a total of twelve bat species were recorded in this area from field surveys and desk studies, as follows:

- barbastelle bat (*Barbastella barbastellus*);
- Natusius' pipistrelle (*Pipistrellus nathusii*);
- whiskered bat (*Myotis mystacinus*);
- Brandt's bat (*Myotis brandtii*);
- Leisler's bat (*Nyctalus leisleri*);
- noctule (*Nyctalus noctula*);

- serotine (*Eptesicus serotinus*)
- Daubenton's bat (*Myotis daubentonii*);
- Natterer's bat (*Myotis nattereri*);
- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*);
- brown long-eared bat (*Plecotus auritus*); and,
- Myotis species.

### *Roosting (Trees)*

2.4.130 A total of 189 trees were subject to an initial assessment in line with the methods described in the Field Survey Methods and Standards (FSMS) document. These included ground based survey and a subsequent climbed inspection where appropriate.

2.4.131 The initial assessment found the following:

- five confirmed bat roosts at two sites;
- 20 trees were assessed as having high potential to support roosting bats;
- 54 trees were assessed as having moderate potential to support roosting bats;
- 110 trees were assessed as having low or negligible potential; these trees were subsequently scoped out of further survey.

2.4.132 Of the 79 trees confirmed to support bat roosts or assessed as having moderate or high potential to support roosting bats:

- 50 trees were subject to a tree climbing survey;
- the remaining 29 trees were not climbed as discussed in the constraints listed in section 1.4.1 and 1.4.2; and

2.4.133 Of the 79 trees which were roosts or assessed as having high or moderate potential 44 trees were subject to a total of 132 emergence surveys.

2.4.134 Two backtracking surveys were undertaken at a site in the north of this area. There was a high number of trees assessed as having high and moderate potential to support roosting bats at this site. Therefore the methodological deviations discussed in sections 1.4.4-1.4.9 were applied. 50 trees were subject to climbed surveys in line with the methodology deviation. Where two back tracking surveys were undertaken and a subsequent 18 emergence surveys (of 44 emergence surveys) were undertaken on six trees.

2.4.135 Details of confirmed tree roosts in this area of the route are provided in Table 33.

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Table 33: Confirmed tree roosts within CFA 11

Ecology survey code	Location	OS grid reference	Tree species	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Distance from the Proposed Scheme
020-BT2-062042	Hartwell House Hotel, Aylesbury	SP 797 126	Beech	Brown long-eared bat (1)	Tree climbing inspection 10 April 2013	Transitional	Split limb with hollow going into secondary branch, approx. 50cm deep. One bat found roosting.	11	Within 250m of land required for the Proposed Scheme
020-BT2-062049	Hartwell House Hotel, Aylesbury	SP 798 127	Beech	Brown long-eared bat (1)	Tree climbing inspection 10 April 2013	Day	Cavity goes up 10-15cm. One bat found roosting.	11	Within 100m of land required for the Proposed Scheme
020-BT2-060010	Hartwell Estate Land	SP 801 123	Cherry	Daubenton's bat (1 single dropping)	Tree climbing inspection 5 March 2013	Day	Dead branch. Old wound into branch cavity. Good shelter. Leads 50cm up.	11	Within 100m of land required for the Proposed Scheme
020-BT2-060008	Hartwell Estate Land	SP 810 115	Lime	Common pipistrelle bat (3-4 droppings)	Tree climbing inspection 5 March 2013	Day	Large hole at the base of a rotten branch.	11	Within 100m of land required for the Proposed Scheme
020-BT2-062002	Hartwell House Hotel, Aylesbury	SP 797 122	Beech	Brown long-eared bat (1)	Tree climbing inspection 10 April 2013	Day	Cavity goes up and back 30-40cm. Slugs present. Damp at top.	11	Within 100m of land required for the Proposed Scheme

### *Roosting (building and structures)*

2.4.136 A total of 34 buildings were subject to an initial assessment and further internal inspections, resulting in the following:

- four buildings were confirmed to support five bat roosts;
- five buildings/structures were assessed as having high potential to support roosting bats;
- nine buildings/structures were assessed as having moderate potential to support roosting bats; and
- the remaining 16 buildings were assessed as having low or negligible potential to support roosting bats; these were subsequently scoped out of further survey.

2.4.137 In total, of the 18 buildings with roosts or assessed with high or moderate potential to support roosting bats:

- eight buildings were subject to a more detailed internal inspection;
- this resulted in four buildings being confirmed to support five roosts, and all four were subject to a total of five emergence surveys;
- four buildings were reassessed as having low potential to support roosting bats and scoped out of further survey; and,
- the remaining 10 buildings were not subject to internal inspections for the reasons discussed in sections 1.5.1 and 1.5.2.

2.4.138 Details of confirmed roosts in buildings/structures in this area of the route are provided in Table [insert number].

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Table 34: Confirmed bat roosts in buildings/structures in CFA 11

Ecology survey code	Location	OS grid reference	Building/structure type	Species confirmed utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Distance from the Proposed Scheme
020-BS2-062-001	Meadoway, Hartwell	SP 797 120	Residential	Brown long-eared bats (1-2 droppings)	Internal building inspection 28 March 2013	Transitional, Satellite, Day and Night Roost	Crevices between hipped rafters, lose felt. A few scattered droppings.	11	Within 100m of land required for the Proposed Scheme
020-BS2-058-001	Land and buildings in and around Moat Farm	SP 827 103	Residential	Brown long-eared bats identified from droppings. Large amounts (1000+ droppings) present	Internal building inspection 14 March 2013	Maternity	Large roof void with exposed timber frame.	11	Within 100m of land required for the Proposed Scheme
020-BS2-058-001	Land and buildings in and around Moat Farm	SP 827 103	Residential	<i>Myotis</i> species	Internal building inspection 14 March 2013	Day	Large roof void with exposed timber frame.	11	Within 100m of land required for the Proposed Scheme
020-BS2-057-001	Building on Risborough Road	SP 835 100	Outbuilding	Common pipistrelle (1 dropping)	Internal building inspection 25 April 2013	Night	Wooden clad shed with no internal roof void.	11	Within 500m of land required for the Proposed Scheme
020-BS2-058-002	Old Moat farmhouse	SP 827 104	Residential	Small number of brown long-eared bat droppings (less than 100 droppings)	Internal building inspection 14 March 2013	Day	Gap in apex to roof tiles, western loft with exposed wooden trusses and bitumen felt lining.	11	Within 500m of land required for the Proposed Scheme

### Bat activity surveys

2.4.139 The following bat species have been recorded during the range of activity surveys carried out in this area:

- barbastelle bat (*Barbastella barbastellus*);
- Natusius' pipistrelle (*Pipistrellus nathusii*);
- whiskered bat (*Myotis mystacinus*);
- Brandt's bat (*Myotis brandtii*);
- Leisler's bat (*Nyctalus leisleri*);
- noctule (*Nyctalus noctula*);
- serotine (*Eptesicus serotinus*)
- Daubenton's bat (*Myotis daubentonii*);
- Natterer's bat (*Myotis nattereri*);
- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*); and
- brown long-eared bat (*Plecotus auritus*).

Table 35: Bat activity surveys conducted within CFA 11

Ecology survey code	Transect/Static location	Number of surveys conducted	First survey date	Final survey date	CFA	Map Reference
020-BA2-065001	Fleet Marston Spinney	5	27 June 2012	18 June 2013	11	SP 774 153
020-BA2-061001	Hartwell Estate	4	24 April 2013	17 July 2013	11	SP 806 120
020-BA2-062001	Harwell House Hotel	4	16 April 2013	11 July 2013	11	SP 796 127
020-BA2-058001	Whitethorn Farm	1	7 May 2013	10 May 2013	11	SP 833 099
020-BA2-058002	Moat Farm	3	17 April 2013	16 July 2013	11	SP 827 104
020-BA2-057001	Stoke House Farm	2	25 April 2013	8 May 2013	11	SP 838 094
020-BA2-065001	Putlowes Farm	7	28 June 2012	23 July 2013	11	SP 782 144

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Table 36 Bat activity transect survey results - Transect o2o-BA1-062001

Ecology survey code	Transect location				Description of habitats covered by transect																	
Visit number and date	Weather conditions				Total species passes during transect survey																	
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (0-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Es	
Visit 1: Dusk 23 April 2013	10°C	3-4	0	1	25	15	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	3
Visit 2: Dusk 22 May 2013	11°C	3	0	2-3	69	14	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0	0
visit 3: Dawn 23 May	12°C	7	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visit 4: Dusk 10 June 2013	7°C	8	0	2-3	14	11	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0
Visit 5: Dawn 12 June 2013	11°C	5	0	1-2	40	11	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Visit 6: 8 July 2013					64	10	0	16	0	0	0	0	0	0	0	2	0	0	0	0	2	0

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Natusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

2.4.140 Both common and soprano pipistrelles were observed on all survey visits. Common pipistrelles were the most frequent bat recorded with 69ppn during May 2013. Soprano pipistrelles were the second most abundant species with 15ppn during April 2012. *Myotis* species,

noctule, serotine and *Nyctalus/Eptesicus* species were recorded in much lower numbers. *Myotis* species were recorded on every survey other than the dawn survey in May 2012. Noctules were recorded less frequently, only being present during May and June 2012. Serotine bats were only observed during mid-July 2012.

2.4.141 Common and soprano pipistrelles were recorded commuting along the road to the south of Hartwell House, and along tree lines and woodland edges throughout the transect route. Commuting activity for these species was observed in all months of the survey. Foraging activity was observed adjacent to the A418 Oxford Road, and woodland to the north and east of Hartwell House. A single noctule was observed commuting northwards from the woodland to the south of Hartwell House in May.

Table 37: Bat activity transect survey results - Transect 020-BA1-064001

Ecology survey code	Transect location				Description of habitats covered by transect																	
Visit number and date	Weather conditions				Total species passes during transect survey																	
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (0-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Es	
Visit 1: 26 June 2012	12	0	0	1	79	71										3			6			1
Visit 2: 7 August 2012	14.5	8	2	2	13	8										1						
Visit 3: 28 August 2012	16	1	0	4	7	6										3			1			1
Visit 4: 29 August 2012	15	2	0	2	5	2											1					
Visit 5: Dawn 24 April 2013	9	6	0	1-2		1										1						
Visit 6: Dusk 24 April 2013	15	8	0	2	47	18		3								5						35
Visit 7: Dusk 20 May 2013	16	8	0	1-2	33	2																

Ecology survey code	Transect location				Description of habitats covered by transect																	
Visit number and date	Weather conditions				Total species passes during transect survey																	
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (0-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Es	
Visit 8: Dawn 23 May 2013	7.5	1	0	0																		
Visit 9: Dusk 11 June 2013	11.5	2-3	0	4	8	3													6			
Visit 10: Dawn 11 June 2013	8	3-7	0	0-1															7			
Visit 11: Dusk 9 July 2013	15.1	4	0	0-1	No data																	
Visit 12: Dawn 10 July 2013	9.7	0	0	2-3	No data																	

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

2.4.142 Common and soprano pipistrelles were recorded in low to moderate numbers across all survey visits with peaks in June 2012 and April 2013. Much lower numbers were observed during other survey visits. *Myotis* species were recorded during June to August 2012 and April 2013 in low numbers. No bats were observed during the dawn survey visits in May or June 2013. A peak count of one pass from a brown

long-eared bat was recorded during late August 2012. Noctule passes were recorded in June and August 2012 and June 2013. *Nyctalus/Eptesicus*<sup>5</sup> bat passes were recorded in low numbers during June and August 2012, and moderate numbers in April 2013.

2.4.143 Common and soprano pipistrelle were recorded foraging and commuting along the hedgerow to the west of Putlowes Cottages, Fleet Marston Spinney and the hedgerows to the south of Putlowes Farm yard. Noctule activity was concentrated close to the River Thame. Foraging was observed over the channel itself and an adjacent pond. The movement patterns indicate that bats are commuting north and north-west from the River Thame and along hedgerows to the south-east of Putlowes Farm towards nearby woodland.

Table 38: Summary of static detector monitoring results for 020-BA2-065001

Ecology survey code	Location	OS Grid				Description of habitat												
020-BA2-065001	Fleet Marston Spinney	SP776 148				Medium age deciduous spinney adjacent to pasture, and linked to adjacent hedgerows.												
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Ep
27 June to 1 July 2012	5	764	64		67							88			6			7
25 July to 31 July 2012	7	100	96		22							14						
16 April 2013 to 20 April 2013	4	78	30									7						
22 May 2013 to 29 May 2013*	7	244	23	1								5						
11 June 2013 to 18 June 2013	7	824	94									20						17

Sonographs from these species can be difficult to separate where only partial calls are recorded.

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

<sup>5</sup> Sonographs from these species can be difficult to separate where only partial calls are recorded.

2.4.144 Moderate to high levels of common pipistrelle activity were recorded during all months surveyed, with notable peaks in activity occurring during June 2012 and 2013 with a total of 824ppn. Lower levels of soprano pipistrelle activity were recorded during all months of survey, with peaks in June and July 2012 and June 2013 with totals of 96 and 94 passes on each transect respectively. The data indicates that the edge of the spinney is being used as a commuting route and foraging area by these species. *Myotis* species were recorded in moderate numbers during June 2012 (a total of 88 passes) and in low numbers during July 2012 (14 passes) and June 2013 (20 passes).

Table 39: Summary of static detector monitoring results for o20-BA2-062002

Ecology survey code	Location	OS Grid		Description of habitat															
o20-BA2-062002	Hartwell Estate, Calley Farm	SP 806 120 (April/May), SP 804 122 (June/July)		The detector was located next to a strip of mixed woodland adjacent to an arable field during April/May. In June/July, the detector was moved to a hedgerow to the north. The wider landscape consists of arable fields and grassland with hedgerows connected to the network of woodland and parkland to the north and hedgerow network to the south.															
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring																
			Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Ep
24-30 April 2013 Hartwell Estate	8	9	1	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0
21-30 May 2013 Hartwell Estate	10	598	31	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
18-19 June Hartwell Estate	2	28	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
11-17 July Hartwell Estate	7	319	16	0	11	0	0	0	0	0	0	1	0	0	0	0	0	0	0

Sonographs from these species can be difficult to separate where only partial calls are recorded.

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - *Nathusius'* pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp. - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.145 Common pipistrelle were recorded during all months of survey with notable peaks in activity during May and July 2013. Soprano pipistrelle were recorded in lower numbers, but also showed peaks in activity in May and July 2013. A peak in *Myotis* species activity was recorded in July 2013, but was limited during all other months, with no records from May 2013. During May 2013, low levels of *Nyctalus/Eptesicus* activity were recorded, and three noctule passes were confirmed.

Table 40: Summary of static detector monitoring results for 020-BA2-062001

Ecology survey code	Location	OS Grid		Description of habitat														
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly																
		Pp	Ppy	Pn	P sp	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	P a	Bb	Nn	Nl	Es	Ny/Ep
16 April 2013 to 21 April 2013	5	112	286	1								176			29			56
22 May 2013 to 28 May 2013	7	24	138		3							395			12	2	4	
4 June 2013 to 10 June 2013	7	1286	1309									382	2		259	16	3	13
2 July 2013 to 11 July 2013	9	1627	2259	1								1230		5	37	8	201	565

Sonographs from these species can be difficult to separate where only partial calls are recorded.

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

2.4.146 Both soprano and common pipistrelle were recorded in all months of survey. Peak activity for both species was during June and July 2013 with up to 2,259 and 1,627ppn recorded respectively. Low to moderate levels of *Myotis* species activity were recorded during April and May. *Myotis* passes were recorded at moderate levels in April, moderate to high levels in May and June, with very high levels in July (peak 1,230ppn). *Nyctalus/Eptesicus* activity peaked in July 2013 with a second peak in June; high levels of activity were recorded during

both recording periods. Lower levels of activity were noted during April and May. A peak of 5ppn by barbastelle bats were recorded in July only. Single passes of Nathusius' pipistrelle were recorded in April and July.

Table 41: Summary of static detector monitoring results at 020-BA2-058001

Ecology survey code	Location	OS Grid		Description of habitat														
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Ep
April-Whitethorn Farm -No data recorded	5																	
7-10 May 2013 Whitethorn Farm	4	828	15	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
June-Whitethorn Farm- No data recorded	5																	
July-Whitethorn Farm- No data recorded	0																	

Sonographs from these species can be difficult to separate where only partial calls are recorded.

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp. - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.147 High levels of common pipistrelle activity were recorded during May 2013. Low levels of soprano pipistrelle and *Myotis* species were also recorded during the same period. Due to access constraints and technical problems with the static detector, no data was collected for the other months of survey.

Table 42: Summary of static detector monitoring results at 020-BA2-058003

Ecology survey code	Location	OS Grid	Description of habitat															
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	Psp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	Msp.	Pa	Bb	Nn	Nl	Es	Ny/Ep
17-20 April 2013	No data recorded																	
15-20 May 2013	7	99	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
June	No data recorded																	
10-16 July 2013	7	235	1516	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4

Sonographs from these species can be difficult to separate where only partial calls are recorded.

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NL - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

2.4.148 Moderate levels of common pipistrelle activity were recorded during May and July 2013. A peak of soprano pipistrelle activity was noted during the July recording period, which indicates its use as a commuting corridor. A single *Myotis* species pass was noted in July 2013. *Nyctalus/Eptesicus* bats were recorded in very low numbers during May and July 2013. Common and soprano pipistrelle were recorded foraging and commuting in the open fields and along the waterway that runs through Moat Farm.

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Table 43: Summary of static detector monitoring results at 020-BA2-057001

Ecology survey code	Location	OS Grid				Description of habitat												
020-BA2-057001	Stoke House Farm	SP838 094				The detector was located next to a stream in an area containing scattered trees. The wider landscape comprised arable farmland.												
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Ep
Stoke House Farm 25 April 2013-30 April 2013	7	543	172	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
Stoke House Farm- 02 May 2013-08 May 2013	7	384	103	0	1	0	0	0	0	0	0	29	0	0	0	0	0	0
June 2013	No data recorded																	
July 2013	No data recorded																	

Sonographs from these species can be difficult to separate where only partial calls are recorded.

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.149 Moderate to high levels of common pipistrelle activity were recorded during both April and May 2013. Soprano pipistrelles were also recorded during the same period. Low levels of *Myotis* species activity were recorded in April and May, with more passes noted during May. No passes from any other species were recorded.

Table 44: Summary of static detector monitoring results for 020-BA2-065-001

Ecology survey code	Location	OS Grid				Description of habitat												
020-BA2-065001	Putlowes Farm	SP 782 144				The detector was located in a species-poor hedgerow containing scattered trees connected to the riparian vegetation along the River Thame. The wider landscape comprised semi-improved grassland and arable farmland.												
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Ep		
28 June 2012 to 4 July 2012	7	609	37		14					25			16			6		
3 August 2012 to 9 August 2012	7	1	1															
24 September to 30 September 2012	7	noise																
16 April 2013 to 20 April 2013	4	10	2						1					1				
15 May 2013 to 21 May 2013	7	1464	38		7	5	1		9	9			6	1				
11 June 2013 to 17 June 2013	7	2429	29							22						17		
17 July 2013 to 23 July 2013	7	1162	731							63						172		

Sonographs from these species can be difficult to separate where only partial calls are recorded.

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

2.4.150 Moderate levels of common pipistrelle activity were observed during June and July 2012 whilst only one pass was noted during August. Low activity was noted during April 2013, but high levels were recorded from May through to July 2013 with a peak in June. Soprano pipistrelle activity was more limited. Low counts were recorded during August 2012 and April 2013, but moderate levels of activity were observed in July 2012, May 2013 and June 2013. High soprano pipistrelle activity was noted during July 2013. *Myotis* species activity was recorded during June/July 2012 and May/June 2013; levels of activity increased during July 2013. No bat passes for any species were

recorded during September 2012. Daubenton's, Natterer's, and whiskered/Brandt's bats were recorded in low numbers during May 2013. Noctules were recorded in low to moderate numbers during July 2012 and April/May 2013. A single Leisler's record was recorded during May 2013. *Nyctalus/Eptesicus* bats were recorded in low to moderate numbers during July 2012 and June 2013, with peak activity for these species recorded during July 2013.

Table 45: Summary of static detector monitoring results for 020-BA2-065-001

Ecology survey code	Location	OS Grid				Description of habitat													
020-BA2-065-001	Waddesdon Putlowes Thame	SP 782 144				Improved grassland with well-connected hedgerows tree lined roads and tributaries from the River Thame running through the site.													
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring																
			Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	
21 June 2013 to 31 June 2013		5	3212	1334		435							725			174	62		22
1 July 2012 to 4 July 2012		4	1058	48		16							4			12	1		
24 August 2012		1	83	5		36							1						
14 October 2012 and 20 October 2012		2	5	2		1													

Sonographs from these species can be difficult to separate where only partial calls are recorded.

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.151 Very high levels of Myotis species, soprano and common pipistrelle were recorded in July 2013 (715, 1,334 and 3,212ppn, respectively). High levels of noctules were also recorded in this month with a peak count of 174ppn. Moderate to high levels of Leisler's were recorded in June 2013 with 62 passes. Lower levels of Leisler's bats were recorded during other surveys, only 1ppn was recorded in July and no further passes of this species were recorded in the 2012 survey season.

Table 46: Summary of static detector monitoring results for 020-BA2-065-001

Ecology survey code	Location	OS Grid				Description of habitat												
020-BA2-065-001	Fleet Marston Spinney	SP 774 153 and SP776 148 *				Hedgerow by arable crop and pasture land with cattle.												
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Ep
16 April 2013 to 20 April 2013	4	78	30									7			2			
22 May 2013 to 29 May 2013*	7	244	23	2								4			5			
11 June 2013 to 18 June 2013	7	828	42	1								8		1	17		1	
17th July 2013 to 24th June 2013	7	1162	731	35								38			137			
5 August 2013 to 9th August 2013	5	966	136	22								9		5	22			5

\*SM2 relocated due to cows – July and August data was also damaged by cows destroying the microphones.

Sonographs from these species can be difficult to separate where only partial calls are recorded.

Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Natusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - Nyctalus/ Eptesicus bat.

2.4.152 High levels of common and soprano pipistrelle activity was recorded at this location, with a peak counts of 1,162 and 731ppn respectively. The passes recorded for both common and soprano pipistrelles were particularly high for June, July and August. Low numbers of barbastelle passes were recorded, with a peak count of 5ppn in August. The location of the static detector was less than 3km from a known roost, which was located from radio tracking surveys. High numbers of noctules were recorded with a ppn of 137. Other less common species including Natusius' pipistrelle, noctules, *Myotis* species and serotine were also recorded.

## Discussion

### Bat Assemblage

2.4.153 Field survey records confirmed the presence of twelve species of bat within this area. These included three rare species (barbastelle bat, whiskered/Brandt's bats and *Nathusius' pipistrelle*), and one scarce species, Leisler's bat.

2.4.154 Desk study records from Buckinghamshire Biological Records Centre further indicate the presence of brown long-eared bats, noctule, common pipistrelles and Daubenton's bats between 400 and 600m from the land required for construction of the Proposed Scheme. Also a single record of soprano pipistrelle bat at a distance of 800m from land required for the Proposed Scheme. The wider area also has records three records of Leisler's bat, Natterer's bat and serotine bats.

### Roosts

2.4.155 A total of five tree roosts and five building roosts were identified from field surveys within the total area. Three tree roosts and three building roosts, all containing evidence of use by brown long-eared bats, were recorded to the south of Aylesbury during the field surveys. The evidence indicates use by a low to moderate number of bats. Two common pipistrelle roosts containing low numbers of individuals were also recorded; one tree roost in the Hartwell Estate and one in an outbuilding to the south of Stoke Mandeville.

2.4.156 Desk study records indicate that there are several further brown long-eared roosts within 500m of land required for construction of the Proposed Scheme. In addition, there are records for two Natterer's bat maternity colonies approximately 3.5km from the route.

### Foraging Habitat

2.4.157 The landscape in this area comprises largely arable and pasture bounded by hedgerows. Lowland mixed deciduous woodland and pasture is present to the southwest of Aylesbury. Watercourses, providing foraging habitat, are present in the south of the area. The Stoke Brook and its tributaries south of Stoke Mandeville run along the boundary of land required for the construction of the Proposed Scheme and are likely to be used as foraging habitat by bats roosting directly to the south of these watercourses.

2.4.158 Foraging activity was noted from activity transects at several locations in the semi-natural and plantation woodland, grassland, parkland, scattered trees and standing water to the south of Aylesbury. Low to moderate numbers of common pipistrelle, soprano pipistrelle, *Myotis* species, noctule and serotine were recorded. Leisler's bats were recorded foraging at Putlowes Farm to the north of Aylesbury. Daubenton's, Natterer's and whiskered/Brandt's bats were recorded at the same site.

2.4.159 Activity and static monitoring surveys at sites around Putlowes, Fleet Marston and Hartwell House recorded very high levels of common and soprano pipistrelles and *Myotis* species with moderate to high levels of noctules. The highest levels of activity were recorded at these sites in June and July. The data indicates these habitats are important for supporting a high number of foraging bats throughout the season. At

Putlowes moderate levels of Leisler's bats were recorded in June 2013 with passes recorded only in July 2013 and none recorded during the 2012 season. This data indicates that these habitats are intermittently used by Leisler's bats.

### *Commuting Habitat*

2.4.160 The hedgerow network in the south of this area is well established and connected, and, in combination with tree-lined roads and the ditch and running water network, provides an extensive network for commuting bats.

2.4.161 Commuting activity from common and soprano pipistrelle bats was recorded along:

- the road to the south of Hartwell House;
- tree lines, woodland edges, and hedgerows to the south of Putlowes Farm;
- Stoke Brook and its tributaries around Moat Farm; and
- the River Thame and Finemere Spinney.

2.4.162 Noctules were observed commuting northwards from the woodland to the south of Hartwell House and along the River Thame.

2.4.163 Consistently low numbers of barbastelle bats were recorded as occasional passes during August at Hartwell House, this site is less than 3km from a known barbastelle roost. This data suggests that the habitat around Hartwell House is serves the barbastelle roost as a commuting route to reach foraging resources. Other uncommon (noctule and serotine) and rare (*Nathusius' pipistrelle*) species were also recorded at this location. Overall, Hartwell House supports abundant, diverse and notable bat species and is therefore of value to the conservation status of bats in this area.

2.4.164 There were no brown long-eared bats recorded on the static detector at Moat Farm, despite its proximity to the brown long-eared maternity roost. As discussed in section 1.6.13 this is likely due to equipment sensitivity and the quiet call characteristics of this species (brown long-eared bats need to fly within approximately 3m of a static detector in order to be recorded) rather than being indicative of an absence of this species in this area.

2.4.165 The commuting habitat in this area is, therefore, important in supporting a diverse bat assemblage and in certain areas, such as Hartwell House and the sites in and around Stoke Mandeville, the habitat features are important for supporting large numbers of bats commuting between roosts and foraging grounds. Commuting features support rare barbastelle bats and *Nathusius' pipistrelles*. These habitats are important for the maintenance of species populations.

### **CFA12 Waddesdon and Quainton**

#### *Overview of bat species status in the vicinity of CFA 12*

2.4.166 Habitats suitable to support roosting, foraging and commuting bats within this area consist of farmland habitats, including arable fields, improved pasture, and an extensive network of intact hedgerows. Those located within and adjacent to the land required for the construction of the Proposed Scheme include unimproved and semi-

improved grassland at Grendon and Doddershall Meadows Local Wildlife Site (LWS). A complex of ancient woodlands collectively known as the Bernwood Forest is present in the north of this area. Aquatic habitats include the River Ray and its tributaries, several drainage channels and ponds.

2.4.167 There are three SSSIs within 500m of the land required for the construction of the Proposed Scheme: Finemere Wood, Sheephause Wood, Grendon and Doddershall Woods. They are all designated for ancient woodland and assemblages of plants, woodland birds and invertebrates. All three are of national value.

2.4.168 The presence of thirteen species were confirmed in this area through field surveys including five rare bats; Bechstein's bat, barbastelle bats, Natusius' pipistrelles, whiskered bat and Brandt's bat and a scarce species; Leisler's bats. Bechstein's bats are very rare and barbastelles are rare, with both being classified as vulnerable at the European level<sup>6</sup>. The populations found in this area are on the edge of the UK ranges for both species<sup>4</sup>. Natusius' pipistrelles, also a rare bat which is not commonly found within the UK, has been confirmed in this area through field surveys (static monitoring surveys only) and desk study records which indicate the presence of this species previous to field surveys. Radio-tracking surveys highlighted the presence of Leisler's bats using this area when a non-breeding female was caught in the 2012 trapping season. Leisler's bats are classified as a scarce species with restricted population ranges<sup>7</sup>. Desk studies also confirmed the presence of Leisler's bats in low numbers within this area.

2.4.169 Two seasons of radio-tracking studies were undertaken between the land north of Station Road, Quainton and Calvert Jubilee LWS in Calvert, Steeple Claydon, Twyford and Chetwode (CFA13) to gain a better understanding of how bats use the landscape for foraging, commuting and roosting that would be bisected by the land required for the construction of the Proposed Scheme. This land covers both CFA12 and CFA13, where possible all results discussed in this report refer to findings only within CFA 12. Commuting routes and foraging grounds however may cross over the two CFA boundaries, where this happens it will be made explicit within the text.

2.4.170 Overall, thirteen species of bats were confirmed as being present in this area, from field surveys and desk study data, as follows:

- Bechstein's bat (*Myotis bechsteinii*);
- barbastelle bat (*Barbastella barbastellus*)
- Natusius' pipistrelle (*Pipistrellus nathusii*);

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<sup>6</sup> Directive 92/43/EEC of the European Parliament and of the Council of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Strasbourg, European Parliament and European Council. The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favorable conservation status, introducing robust protection for those habitats and species of European importance.

2. 6 Bat Conservation Trust (2012), The state of the UK's bats: National Bat Monitoring Programme Population Trends 2012, BCT, London.

3. (Hill and Greenaway 2006) Putting Bechstein's at on the map. Final Report to Mammals Trust UK. London

<sup>7</sup> Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favorable conservation status, introducing robust protection for those habitats and species of European importance.

3. Hill, D A, & Greenaway, F. (2006), Putting Bechstein's bat on the map. Final Report to Mammals Trust UK. London.

4. Wray, Wells, Long and Mitchell-Jones, (2010), Valuing Bats in Ecological Impact Assessment.

- whiskered bat (*Myotis mystacinus*);
- Brandt's bat (*Myotis brandtii*);
- Leisler's bat (*Nyctalus leisleri*);
- noctule bat (*Nyctalus noctula*);
- serotine bat (*Eptesicus serotinus*);
- Natterer's bat (*Myotis natterii*);
- Daubenton's bat (*Myotis daubentonii*);
- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*); and
- brown long-eared bat (*Plecotus auritus*).

### *Roosting (Trees)*

2.4.171 The data below do not include information on roosts obtained from radio-tracking and trapping. Information collected from radio-tracking is discussed separately.

2.4.172 A total of 111 trees were subject to an initial assessment in line with the methods described in the Field Survey Methods and Standards (FSMS). These surveys included ground based tree assessments and climbed inspections where appropriate.

2.4.173 Initial assessments of the 111 trees found the following:

- two tree roosts (which were later confirmed through emergence surveys to be a common pipistrelle roost and a *Myotis* species roost);
- 18 trees were identified as having high potential to support roosting bats;
- 41 trees were identified as having moderate potential to support roosting bats; and
- the remaining 50 trees were classified as having low or negligible potential; these trees were subsequently scoped out of further surveys.

2.4.174 Of the 61 trees which were confirmed as roosts or assessed as having moderate or high potential to support roosting bats;

- 59 were subject to a more detailed climbing inspection;
- 42 of these trees were subjected to emergence surveys, remaining trees were not subjected to emergence surveys due to constraints discussed in section 1.4.1;
- two trees were not subject to climbed inspections due to constraints discussed in section 1.4.1; and,
- none of the 59 trees that were subject to a climbed survey were reassessed as having low or negligible potential to support roosting bats.

2.4.175 No back tracking surveys were undertaken within this route section.

2.4.176 Details of confirmed tree roosts in this area are provided in Table 1.

2.4.177 There are over 2000 desk study records for bat tree roosts in the area, with most of them representing roosts that are at a considerable distance from the Proposed Scheme. There are at least 58 roosts within 1.5 km of the scheme with a variety of roosts and maternity colonies identified within the SSSI woodlands (part of the Bernwood Forest complex) which surround the land required for construction of the Proposed Scheme. Relevant records from the desk study are discussed alongside records of roosts obtained from radio-tracking surveys.

2.4.178 A further desk study record indicates a serotine roost, for which no roosts were identified from field surveys, which is located within 1km of the land required for the construction of the Proposed Scheme, near Waddesdon. Other records show the presence of common and widespread species, and those that are uncommon such as noctule bats and rare such as some *Myotis* species within 3km of the land required for construction of the Proposed Scheme.

Table 47: Confirmed tree roosts within CFA12 from initial tree and climbing surveys

Ecology survey code	Location	OS grid reference	Tree species	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
020-BT3-075-002	Woodlands Farmhouse, Doddershall, Quainton (HP22 4DE)	SP 718 211	Ash	Common pipistrelle (8 bats)	21 September 2013 Emergence survey	Day	Hole extends 50cm into limb, some internal crevices, evidence of bird use	12	Within 50m of land required for the Proposed Scheme
020-BT3-074-003	Woodlands Farmhouse, Doddershall, Quainton (HP22 4DE)	SP 716 212	Oak	<i>Myotis</i> sp. (suspected Whiskered bat from supplementary radio-tracking data) ( 8 bats)	21 September 2013 Emergence survey	Day	Small hole into trunk then extending upwards	12	Within 50m of land required for construction of the Proposed Scheme

### *Roosts (Radio-tracking)*

2.4.179 Radio-tracking studies and desk-top data recorded a population of Bechstein's bat comprising at least three maternity colonies each containing multiple roosts, these colonies were either side of the Proposed Scheme. A colony was containing at least nine roosts was recorded within Finemere Wood, 250 metres to the east of the

Proposed Scheme. Additional roosts were identified in nearby Romer Wood with associated foraging habitat in Greatsea, Romer, Runts and Balmore Woods. There is also a single roost in Sheephause Wood. Surveys and desk study data provide records of a colony of several roosts in Doddershall Wood including a large maternity roost, approximately 1km south of the Proposed Scheme, and there are nearby roosts at Hewin's Wood and to the south and west of Doddershall House. Bechstein's bat were also recorded roosting and foraging in Sheephause Wood and Decoypond Wood. The third colony is at Ham Home Wood and Ham Green Wood approximately 2km from the closest part of the Proposed Scheme.

2.4.180 A total of 97 roosting locations were identified across both CFA12 and CFA13 throughout both radio-tracking seasons. Of these 90 roosting locations were identified within CFA12 (and seven of these roosting locations were within CFA 13) with 64 of these roosting locations recorded in 2013 and 26 roosting locations identified in 2012.

2.4.181 Of the 90 radio-tagged bats recorded within CFA12 a total 10 species roosts were located from radio-tracking surveys and are summarised below:

- one barbastelle roost was located in a small fragment of woodland south of Waddesdon;
- A total of 19 Bechstein's bat roosts were identified with eight roosts located in or around Finemere Woods, seven roosts in Grendon and Doddershall, one roost in Hewin's wood and one roost in Sheephause Wood. Further roosts were found at Ham Green Wood and Greatsea/Romer Woods;
- a total of five Brandt's bat roosts were found, three located within Sheephause Wood and one roost in Finemere Wood and a roost in a residential property to the south of Finemere Wood;
- a total of 24 brown long-eared roosts were found, 15 of these were located with Finemere Woods, three in Greatsea and Romer Woods, four within Sheephause Wood;
- Two roosts are located on or directly adjacent to the Aylesbury Link Railway which is within the land required for construction of the Proposed Scheme and one of which is a maternity roost. The other two roosts are located at a residential building to the south of Finemere Wood and another within Hewin's Wood. Two of the four roosts within Sheephause Wood are located within 25m of the land required for the construction of the Proposed Scheme;
- three common pipistrelles roosts were also located in land south of the Finemere Wood along the Aylesbury Link Railway;
- a total of 18 Daubenton's roosts were recorded from radio-tracking surveys across both CFAs of these 12 roosts occurred within CFA12. Three in Sheephause Wood and six in Finemere Wood, two in Grendon and Doddershall Woods and one at Addlington Manor;
- twelve Natterer's roosts were identified, two in Grendon and Doddershall

woods, seven in Finemere Wood and one located along Akeman Disused Railway and one in Hewin's Wood;

- one noctule roost was located in Doddershall Wood;
- three soprano pipistrelles roosts were recorded, one at Finemere Wood and two at residential properties to the south of Finemere Wood; and
- ten whiskered roosts were recorded, three at Doddershall Wood, two at residential properties to the south of Finemere Wood, two in Finemere Wood and one roost in each of Sheephause Wood, Romer Wood and at Edgcott.
- five tree roosts identified from radio-tracking were subjected to emergence surveys these included: two Bechstein's roost, one in the Ash tree north of Finemere and one in Finemere; a Brandt's roost within a residential property; a Natterer's roost and a brown long-eared roost in Finemere; and
- the remaining roosts from radio-tracking were not subject to emergence surveys due to time constraints and access to sites as discussed in section 1.6.8 and 1.6.9.

2.4.182 The desk study records provides data reinforcing evidence on species and their colonies collected from radio-tracking studies. This includes records of the Bechstein's, noctule and Daubenton's maternity colonies present in Grendon and Doddershall Woods, the Natterer's, Bechstein's, whiskered and brown long-eared maternity colonies in Finemere Woods, Greatsea and Romer Wood and in Runts Wood.

Table 48: Confirmed roosts from radio-tracking studies 2012 within CFA12

<b>Ecology survey code</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Tree /Building</b>	<b>Species confirmed as utilising roost and (peak count)</b>	<b>Date of peak count and nature of survey</b>	<b>Roost type</b>	<b>CFA</b>	<b>Approximate distance from the Proposed Scheme</b>
020-BA4-075005	Doddershall Wood	SP 698 207	Tree	Bechstein's bat	2012	Maternity	12	1.19km from land required for the Proposed Scheme
020-BA4-075013	Hewin's Wood	SP 704 216	Tree	Bechstein's bat	2012	Day	12	Within 150m from land required for the Proposed Scheme
020-BA4-075002	Grendon Wood	SP 698 205	Tree	Bechstein's bat	2012	Maternity	12	1.5 km from land required for the Proposed Scheme
020-BA4-074001	Ham Green Wood	SP 697 192	Tree	Bechstein's bat	2012	Maternity	12	Within 1km from land required for the Proposed Scheme
020-BA4-075007	Doddershall Wood	SP 699 208	Tree	Bechstein's bat	2012	Maternity	12	1 km from land required for the Proposed Scheme
020-BA4-075009	Doddershall Wood	SP 699 208	Tree	Bechstein's bat	2012	Maternity	12	1.km from land required for the Proposed Scheme
020-BA4-077005	Sheephause Wood	SP 703 235	Tree	Brandt's bat	2012	Maternity	12	500m from land required for the Proposed Scheme
020-BA4-075022	Finemere Wood	SP 713 220	Building	Brown long-eared	2012	Maternity	12	300m from land required for the Proposed Scheme
020-BA4-077002	Sheephause Wood	SP 698 233	Tree	Brown long-eared	2012	Maternity	12	Within land required for the Proposed Scheme
020-BA4-077003	Sheephause Wood	SP 697 234	Tree	Brown long-eared	2012	Maternity	12	Adjacent to land required for the Proposed Scheme
020-BA4-075049	Greatsea Wood	SP 712 225	Tree	Brown long-eared	2012	Maternity	12	500m from land required for the Proposed Scheme
020-BA4-075050	Greatsea Wood	SP 714 225	Tree	Brown long-eared	2012	Maternity	12	500m from land required for the Proposed Scheme

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<b>Ecology survey code</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Tree /Building</b>	<b>Species confirmed as utilising roost and (peak count)</b>	<b>Date of peak count and nature of survey</b>	<b>Roost type</b>	<b>CFA</b>	<b>Approximate distance from the Proposed Scheme</b>
020-BA4-076001	Greatsea Wood	SP 713 229	Tree	Brown long-eared	2012	Maternity	12	500m from land required for the Proposed Scheme
020-BA4-075026	Finemere Wood	SP 713 220	Tree	Brown long-eared	2012	Maternity	12	250m from land required for the Proposed Scheme
020-BA4-075015	Hewin's Wood	SP 705 218	Tree	Brown long-eared	2012	Day	12	Adjacent to land required for the Proposed Scheme
020-BA4-074011	Woodlands Farm	SP 713 214	Building	Common pipistrelle	2012	Maternity	12	Within land required for the Proposed Scheme
020-BA4-074007	Woodlands Farm	SP 716 212	Building	Common pipistrelle	2012	Maternity	12	Within land required for the Proposed Scheme
020-BA4-076001	Sheephouse Wood	SP 705 232	Tree	Daubenton's bat	2012	Maternity	12	500m from land required for the Proposed Scheme
020-BA4-075018	Finemere Wood	SP 712 219	Tree	Natterer's bat	2012	Maternity	12	200m from land required for the Proposed Scheme
020-BA4-075019	Finemere Wood	SP 714 219	Tree	Natterer's bat	2012	Maternity	12	300m from land required for the Proposed Scheme
020-BA4-075020	Finemere Wood	SP 713 219	Tree	Natterer's bat	2012	Maternity	12	250m from land required for the Proposed Scheme
020-BA4-075028	Finemere Wood	SP 713 220	Tree	Natterer's bat	2012	Maternity	12	300m from land required for the Proposed Scheme
020-BA4-075021	Greatmoor	SP 706 219	Tree	Natterer's bat	2012	Day	12	Adjacent to land required for the Proposed Scheme
020-BA4-074009	Woodlands Farm	SP 714 212	Tree	Soprano pipistrelle	2012	Maternity	12	Within 100m from land required for the Proposed Scheme

Ecology survey code	Location	OS grid reference	Tree /Building	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	CFA	Approximate distance from the Proposed Scheme
020-BA4-074008	Woodlands Farm	SP 714 212	Tree	Whiskered bat	2012	Maternity	12	within 100m from land required for the Proposed Scheme
020-BA4-077007	Sheephouse Wood	SP 699 236	Tree	Whiskered bat	2012	Maternity	12	Within 300m from the land required for the Proposed Scheme

Table 49: Confirmed roosts within CFA12 from radio-tracking studies 2013

Ecology survey code	Location	OS grid reference	Tree/Building	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	CFA	Approximate distance from the Proposed Scheme
020-BA4-075055	Waddesdon Manor	SP 740 157	Tree	Barbastelle bat	May	Day	12	Within 1.5km of the Proposed Scheme
020-BA4-075035	Finemere Wood	SP 717 220	Tree	Bechstein's bat	May	Maternity	12	Within 425m of the Proposed Scheme
020-BA4-075040	Finemere Wood	SP 716 221	Tree	Bechstein's bat	May	Maternity	12	Within 300m of the Proposed Scheme
020-BA4-075032	Finemere Wood	SP 718 220	Tree	Bechstein's bat	May	Maternity	12	Within 500m of the Proposed Scheme
020-BA4-075036	Finemere Wood	SP 716 221	Tree	Bechstein's bat	May	Maternity	12	Within 300m of the Proposed Scheme
020-BA4-075044	Finemere Wood	SP 717 222	Tree	Bechstein's bat	May	Maternity	12	Within 350m of the Proposed Scheme
020-BA4-074012	Finemere Wood	SP 719 218	Tree	Bechstein's bat	May	Maternity	12	Within 420m of the Proposed Scheme
020-BT3-	Oak tree West of Ham green cum Ham	SP 689 193	Tree-Oak	Bechstein's bat	August	Maternity	12	Within 1.75km of the

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Ecology survey code	Location	OS grid reference	Tree/Building	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	CFA	Approximate distance from the Proposed Scheme
074-001x	Home -							Proposed Scheme
020-BA4-075030	West Finemere Wood	SP 713 220	Tree-Oak	Bechstein's bat	August	Maternity	12	Within 60m of the Proposed Scheme
020-BA4-075-008	Grendon and Doddershall Wood	SP 699 208	Tree	Bechstein's bat	August	Maternity	12	Within 90m of the Proposed Scheme
020-BA4-075047	North of northern finger of Finemere Wood	SP 717 223	Tree-Oak	Bechstein's bat	August	Maternity	12	Within 320m of the Proposed Scheme
020-BA4-075-004	Doddershall Wood	SP 699 207	Tree	Bechstein's bat	July	Maternity	12	Within 1.2km of the Proposed Scheme
020-BA4-076-008	Greatsea / Romer	SP 712 232	Tree	Bechstein's bat	July	Maternity	12	Within 400m of the Proposed Scheme
020-BA4-074-012	Sheephouse	SP 702 235	Tree	Bechstein's bat	July	Day	12	Within 500m of the Proposed Scheme
020-BA4-076-004	Sheephouse Wood	SP 702 230	Tree	Brandt's bat	June	Maternity	12	Within 90m of the Proposed Scheme
020-BA4-076-011	Central Sheephouse Wood	SP 702 232	Tree	Brandt's bat	August	Maternity	12	Within 320m of the Proposed Scheme
020-BA4-077-001x	Tree or House near church at Edgcott. No Access	SP 679 228	Tree	Brandt's bat	August	Maternity	12	Within 1.75km of the Proposed Scheme
020-BA4-074014	Finemere Wood	SP 719 219	Tree-Oak	Brandt's bat	July	Maternity	12	Within 525m of the Proposed Scheme
020-BT2-074016	Finemere Wood	SP 718 219	Tree-Oak	Brown long-eared bat	August	Maternity	12	Within 480m of the Proposed Scheme
020-BT2-074017	Finemere Wood	SP 718 219	Tree-Oak	Brown long-eared bat	August	Maternity	12	Within 520m of the Proposed Scheme

Ecology survey code	Location	OS grid reference	Tree/Building	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	CFA	Approximate distance from the Proposed Scheme
020-BA4-075004	Finemere Wood	SP 718 220	Tree-Silver birch	Brown long-eared bat	August	Maternity	12	Within 460m of the Proposed Scheme
020-BA4-075-004	Finemere Wood	SP 718 210	Tree-Oak	Brown long-eared bat	August	Maternity	12	Within 650m of the Proposed Scheme
020-BA4-077-004	South Sheephause Wood - same as bat 13	SP 700 230	Tree	Brown long-eared bat	August	Maternity	12	Within 10m of the Proposed Scheme
020-BA4-076-002	South Sheephause Wood	SP 702 230	Tree	Brown long-eared bat	August	Maternity	12	Within 120m of the Proposed Scheme
020-BA4-074016	Finemere Wood	SP 719 220	Tree-Oak	Brown long-eared bat	August	Maternity	12	Within 550m of the Proposed Scheme
020-BA4-075041	Finemere Wood	SP 714 221	Tree- Ash	Brown long-eared bat	July	Maternity	12	Within 50m of the Proposed Scheme
020-BA4-075024	Finemere Wood	SP 712 220	Tree	Brown long-eared bat	June	Maternity	12	Within 15m of the Proposed Scheme
020-BA4-075039	Finemere Wood	SP 713 221	Tree	Brown long-eared bat	June	Maternity	12	Within 25m of the Proposed Scheme
020-BA4-075037	Finemere Wood	SP 714 221	Tree	Brown long-eared bat	June	Maternity	12	Within 60m of the Proposed Scheme
020-BA4-0875017	Finemere Wood	SP 714 219	Tree	Brown long-eared bat	June	Maternity	12	Within 280m of the Proposed Scheme
020-BA4-075023	Finemere Wood	SP 714 220	Tree	Brown long-eared bat	June	Maternity	12	Within 175m of the Proposed Scheme
020-BA4-075031	Finemere Wood	SP 713 220	Tree	Brown long-eared bat	June	Maternity	12	Within 100m of the Proposed Scheme
020-BA4-	Sheephause Wood	SP 705 231	Tree	Brown long-eared bat	May	Maternity	12	Within 90m of the

Ecology survey code	Location	OS grid reference	Tree/Building	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	CFA	Approximate distance from the Proposed Scheme
075051								Proposed Scheme
020-BA4-075022	Finemere Wood	SP 713 220	Building	Brown long-eared bat	July	Maternity	12	Within 100m of the Proposed Scheme
020-BT2-079001	Calvert Jubilee	SP 681 250	Tree-Blackthorn	Common pipistrelle	April	Maternity	12	Within 100m of the Proposed Scheme
020-BA4-075012	Grendon/Doddershall	SP 698 214	Tree	Daubenton's bat	July	Maternity	12	Within 750m of the Proposed Scheme
020-BA4-075016	Finemere Wood	SP 713 219	Tree	Daubenton's bat	May	Day	12	Within 250m of the Proposed Scheme
020-BA4-074004	Doddershall Wood	SP 700 202	Tree	Daubenton's bat	May	Maternity	12	Within 750m of the Proposed Scheme
020-BA4-074015	Finemere Wood	SP 718 220	Tree-Oak	Daubenton's bat	August	Maternity	12	Within 450m of the Proposed Scheme
	Finemere Wood	SP 717 221	Tree-Oak	Daubenton's bat	August	Maternity	12	Within 400m of the Proposed Scheme
020-BA4-075046	Finemere Wood	SP 717 223	Tree-Ash	Daubenton's bat	August	Maternity	12	Within 350m of the Proposed Scheme
020-BA4-075043	Finemere Wood	SP 717 221	Tree-Oak	Daubenton's bat	August	Maternity	12	Within 350m of the Proposed Scheme
020-BA4-076013	Central Sheephause Wood	SP 703 233	Tree	Daubenton's bat	August	Maternity	12	Within 310m of the Proposed Scheme
020-BA4-076010	East Sheephause Wood	SP 704 231	Tree	Daubenton's bat	August	Maternity	12	Within 75m of the Proposed Scheme
020-BA4-075011	Estimated roost in small wooded area at Addington Manor - no access	SP 744 284	Building	Daubenton's bat	August	Maternity	12	Within 4.25km of the Proposed Scheme

Ecology survey code	Location	OS grid reference	Tree/Building	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	CFA	Approximate distance from the Proposed Scheme
020-BA4-077006	Finemere Wood	SP 715 220	Oak	Daubenton's bat	July	Maternity	12	Within 200m of the Proposed Scheme
020-BA4-075010	Grendon Wood	SP 700 210	Tree	Natterer's bat	July	Maternity	12	Within 850m of the Proposed Scheme
020-BA4-075011	Grendon Wood	SP 699 213	Tree	Natterer's bat	June	Maternity	12	Within 725m of the Proposed Scheme
020-BA4-075014	Land on the north side of Akeman Street	SP 710 216	Tree	Natterer's bat	June	Maternity	12	Within 140m of the Proposed Scheme
020-BA4-075033	Finemere Wood	SP 713 220	Tree	Natterer's bat	June	Maternity	12	Within 50m of the Proposed Scheme
020-BA4-075045	Part of land at Calvert	SP 712 222	Tree	Natterer's bat	June	Maternity	12	Within the Proposed Scheme
020-BA4-074017	Botolph Claydon	SP 748 235	Tree	Natterer's bat	June	Maternity	12	Within 560m of the Proposed Scheme
020-BA4-075027	Finemere Wood	SP 715 220	Tree	Natterer's bat	May	Maternity	12	Within 525m of the Proposed Scheme
02-BA4-074005	Doddershall Wood	SP 700 204	Tree	Noctule	August	Maternity	12	Within 900m of the Proposed Scheme
020-BA4-074006	Woodlands Farmhouse	SP 715 211	Building	Soprano pipistrelle	June	Maternity	12	Within the Proposed Scheme
020-BA4-075029	Finemere Wood	SP 715 220	Tree	Soprano pipistrelle	June	Maternity	12	Within 460m of the Proposed Scheme
020-BA4-074010	Woodlands Barn	SP 714 213	Building	Whiskered bat	June	Maternity	12	Within 30m of the Proposed Scheme
020-BA4-	Romer/Greatsea/Balmore Wood	SP 715 233	Tree	Whiskered bat	July	Maternity	12	Within 600m of the

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Ecology survey code	Location	OS grid reference	Tree/Building	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	CFA	Approximate distance from the Proposed Scheme
076014								Proposed Scheme
020-BA4-075003	Doddershall Wood	SP 700 206	Tree	Whiskered bat	June	Maternity	12	Within 1.25km of the Proposed Scheme
020-BA4-075001	Doddershall Wood	SP 699 204	Tree	Whiskered bat	June	Maternity	12	Within 1.4km of the Proposed Scheme
020-BA4-074003	Doddershall Wood	SP 699 202	Tree	Whiskered bat	June	Maternity	12	Within 1.4km of the Proposed Scheme
020-BA4-074013	Finemere Wood	SP 719 219	Tree	Whiskered bat	May	Maternity	12	Within 425m of the Proposed Scheme
020-BA4-075048	North of Finemere Wood	SP 715 224	Tree	Whiskered bat	May	Maternity	12	Within 175m of the Proposed Scheme
020-BA4-075039X	Edgcott	SP 679 227	Building	Whiskered bat	July	Maternity	12	Within 2km of the Proposed Scheme

### *Roosting (building and structures)*

2.4.183 Ten buildings were subject to an external assessment within this route section and subsequent internal inspections where appropriate. The results of these assessments were;

- two buildings were confirmed to support four bat roosts;
- two buildings or structures were assessed as having high potential to support roosting bats; and
- four buildings were assessed as having moderate potential to support roosting bats.

2.4.184 Of the 10 buildings identified as having confirmed roosts or high or moderate potential to support roosting bats:

- one building was being subject to an internal inspection, resulting in the identification of a brown long-eared bat roost, confirming one of the identified roosts stated above;
- the remaining buildings could not be internally inspection owing to access restrictions;
- three buildings were subject to a total of nine emergence surveys, which lead to the confirmation of three roosts; and
- the remaining seven buildings were not subjected to emergence surveys owing to constraints outlined in section 1.5.1 and 1.5.2 in the constraints section.

2.4.185 Details of confirmed roosts in buildings/structures in this area of the route are provided in Table 50.

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Table 50: Confirmed bat roosts in buildings/structures in CFA12

Ecology survey code	Location	OS grid reference	Building/structure type	Species confirmed utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
020-BS3-068-001	Way-side Farm	SP 757 169	Residential	Brown long-eared (1)	30 May 2013 Bat emergence	Day	Southern elevation of the	12	Within 100m of land required for the Proposed Scheme
020-BS3-068-001	Way-side Farm	SP 757 169	Residential	Common pipistrelle (7)	30 May 2013 Bat emergence	Maternity	Northern and eastern elevation. Behind wooden cladding, under eaves and under former flashing	12	Within 100m of land required for the Proposed Scheme
020-BS3-074-001	Wood-lands Farm	SP 715 213	Residential	Common pipistrelle (1)	30 April 2013 Bat emergence	Day	Northern elevation.	12	Within 100m of land required for the Proposed Scheme
020-BS2-074-001	Wood-lands Farm	SP 715 213	Residential	Brown long-eared (Droppings)	04 February 2013 Building internal inspection	Maternity	Roof void	12	Within 100m of land required for the Proposed Scheme

### *Bat activity surveys*

2.4.186 This area can broadly be divided into a northern and southern section. In the south is Waddesdon and surrounding area, which includes sites that border land that had moderate bat activity in CFA11. In the north is the Bernwood Forest area which is located between Quainton (the land north of Station road) and Calvert. The land between Quainton and Calvert was subject to intensive field surveys which included radio-tracking surveys. Both of these sections contain high numbers of roosts, as described above, and high levels of bat activity was recorded from the static detector monitoring. For the purposes of this report, the radio-tracking data has been recorded in separate tables to data collected from other field surveys. Where the methodology varied slightly for the radio-tracking project (such as the static detector monitoring) across the two survey seasons, the resulting data are also shown in separate tables.

2.4.187 As discussed in the Section 1.9, low, moderate and high activity levels have been specifically defined for different bat species. For example; for common pipistrelles, activity of 200-500 passes per night (ppn) would be considered moderate, as activity can peak at 2-3,000ppn (classified as very high). However, Natusius' pipistrelle activity is considered high if 100-200ppn are recorded, as they are rare and have more restricted habitat requirements. Numbers of other species rarely reach the same levels of common pipistrelles. Therefore, comparing activity levels of rare species with each other rare species rather than with common pipistrelles provides greater insight into the relative value of these species in the area.

2.4.188 Static detector data collection methodology changed in 2013 from individual sample locations to the placement of arrays. An array consisted of three static monitoring detectors each with two microphones placed at a distance of 16m apart to be able to distinguish the differences in bat commuting using the Mega Ditch<sup>8</sup> or the adjacent the Aylesbury Link Railway. These arrays were placed between the Mega Ditch, the existing railway and surrounding habitat so as to provide distinctions on commuting behaviour in this survey area and to inform the design of appropriate mitigation.

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<sup>8</sup> Deepened and widened diversion of the Muxwell Brook close to Sheephause Wood and adjacent to parts of the Bridleway GUN/25, containing scattered scrub and wetland vegetation.

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Table 51: Bat activity surveys conducted within CFA 12

Ecology survey code	Transect location	Number of surveys conducted	First survey date	Final survey date	CFA	Map Reference
020-BA1-065-001	Fleet Marston heading north	4 (25 nights)	16 April 2013	24 July 2013	12	SP 755 168
020-BA1-073-075-001	Quainton to Calvert	10 (10 dawn and dusks)	26 June 2013	14 August 2013	12	SP 714 214
020-BA2-074-001	Finemere east	5 (36 nights)	27 June 2012	18 October 2012	12	SP 718 211
020-BA2-075-001	Finemere west	5 (66 nights)	27 June 2012	26 October 2012	12	SP 710 219
020-BA2-076-001	Bernwood Array 1: North Mega Ditch south of Calvert Landfill Site	18 (254 nights)	13 May 2013	14 August 2013	12	SP 702 227 (Left mic) SP 703 338 (Right mic)
020-BA2-076-002-floating Array between Array 1&2	Bernwood Floating Array between Array 1&2 between the operational railway and Mega Ditch	4 (26 nights)	6 June 2013	2 July 2013	12	SP 702 227 (Left mic) SP 702 228 (Right mic)
020-BA2-075-002	Bernwood Array 2-South Mega Ditch north of Benfield's over-bridge	6 (40 nights)	13 May 2013	16 July 2013	12	SP 706 223 (Left Mic) SP 706 223 (Right mic)
020-BA2-075-003-	Bernwood Array 3 – where the Akeman street disused railway and the current railway meet between Grendon Junction and Benfield's green overbridge	8 (58 nights)	29 May 2013	7 August	12	SP 710 219 (Left mic) SP 710 219 (Right mic)
020-BA2-075-004	Bernwood floating Array between arrays 3 & 4 at Grendon Junction	2 (14 nights)	6 June 2013	13 July 2013	12	SP 710 218 (Left mic) SP 710 218 (Right mic)
020-BA2-074-002	Bernwood Array four Woodlands Farm Fishing Lakes- based along the hedgerow to the south of the lakes	3 (21 nights)	30 May 2013	23 July 2013	12	SP 713 215 (Left mic) SP 713 215 (Right mic)

Table 52: Bat activity transect survey results - Transect 020-BA1-065-001- Fleet Marston heading north

<b>Ecology survey code</b>	<b>Transect location</b>				<b>Description of habitats covered by transect</b>																	
020-BA1- 065-001	Fleet Marston heading north				Arable farmland with river and water bodies																	
<b>Visit number and date</b>	<b>Weather conditions</b>				<b>Total species passes during transect survey</b>																	
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (1-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Es	
Visit 1: Dusk 27 June 2012	16	3	0	1	80	71		14								2			8			1
Visit 2: Dusk 7 August 2012	14.5	7	3	3	65	48		5								25			5			2
Visit 3: Dawn 29 August 2012	16	1	0	4	9	2		5								1	1					
Visit 1: Dawn 24 April 2013	9	6	0	1-2		1					1											
Visit 2: Dusk 24 April 2013	15	8	0	2	47	18		3								5						35
Visit 3: Dusk 20 May 2013	16	8	0	1-2	33	2																
Visit 4: Dawn 23 May 2013	7.5	1	0	0																		
Visit 5: Dawn 11 June 2013	8	3-7	0	0-1		4													7			
Visit 6: Dusk 11 June 2013	11.5	2-3	0	4	8	3													6			
Visit 7: Dusk 9 July 2013	15.1	4	0	0-1	6	7										3		2				

Ecology survey code	Transect location				Description of habitats covered by transect																
Visit number and date	Weather conditions				Total species passes during transect survey																
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (1-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Es
Visit 8: Dawn 10 July 2013	9.7	0	0	2-3	3	4		2							2			10			

2.4.189 Moderate to low numbers of pipistrelle species were recorded in both 2012 and 2013. Surveys in 2012 recorded higher pipistrelle bat activity with a peak count of 80 common pipistrelle passes per night (ppn) and 71 soprano pipistrelle ppn compared with peaks of 47ppn and 18ppn for common and soprano pipistrelle respectively in 2013. Noctule activity was relatively consistent with a peak of 10 passes per night in July 2012, although no activity was noted in April and May. *Myotis* activity was higher in 2012 than 2013 with a peak count of 25ppn compared with five ppn in 2013. Occasional passes from brown long-eared bats were recorded with a peak count of three ppn in 2013 and one ppn recorded in 2012.

Table 53: Bat activity transect survey results - Transect 020-BA1-065-001- Quainton to Calvert Railway

Ecology survey code	Transect location				Description of habitats covered by transect																
Visit number and date	Weather conditions				Total species passes during transect survey <sup>9</sup>																
	Temp (°C)	Cloud (0-8) <sup>10</sup>	Rain (0-5) <sup>11</sup>	Wind (0-12) <sup>12</sup>	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Es
Visit 1: 26 June 2012	16	2	0	2	39	5									6			13			
Visit 2: 8 August	16	2	0	4	19	1		2							8				2		1

<sup>9</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - *Nathusius'* pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

<sup>10</sup> Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

<sup>11</sup> Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

<sup>12</sup> Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

Ecology survey code	Transect location				Description of habitats covered by transect																
Visit number and date	Weather conditions				Total species passes during transect survey <sup>9</sup>																
	Temp (°C)	Cloud (0-8) <sup>10</sup>	Rain (0-5) <sup>11</sup>	Wind (0-12) <sup>12</sup>	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Es
2012																					
Visit 3: 04 September 2012	16	3	0	4	5	2		2											5		
Visit 4: 26 June 2013	15	3	0	1	157	5										7	3		1		
Visit 5: 27 June 2013 dawn	12	5	0	1	38	13										4	1				
Visit 6: 27 June 2013 dusk	16	4	0	3	28	12										1			17		
Visit 7: 28 June 2013	12	7	0	2	84	3										1			3		
Visit 8: 3 July 2013 dusk	17	2	0	1	126	26										5			26		
Visit 9: 4 July 2013 dawn	14	8	1	0	152	9		2								10			8		
Visit 10: 8 July 2013 dusk	20-14	0	0	3-1	205	6										4			46		
Visit 11: 9 July 2013 dawn	12	0	0	1	110	4										14			5		

2.4.190 Low-moderate numbers of common pipistrelle passes were recorded during June and July 2013 with peak count of 205ppn in July. Soprano pipistrelle activity was moderate to low during June and July 2013 with a peak count of 26ppn in July. Noctule activity was recorded in moderate

to high numbers for that species with a peak total of 46ppn. *Myotis* sp. were recorded in low to moderate numbers throughout this transect with a peak count of 14ppn. Low levels of brown long-eared bat activity were recorded, with records only occurring in June with a peak count of three ppn.

Table 54: Summary of static detector monitoring results for 020-BA2-074-001

Ecology survey code	Location	OS Grid		Description of habitat															
020-BA2-074-001	Finemere East	SP 718 211		Hedgerow edge facing an arable field with ancient SSSI woodland to the NE															
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring <sup>13</sup> [insert the highest number of bat passes recorded on any one night during deployment]																
			Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Ep
27 June 2012 to 29 June 2012 (SM2 malfunction)		3																	
25 July 2012 to 31 July 2012		7	294	3		40								15					
1 August 2012 to 3 August 2012		3	274	1		111								11					
20 September 2012 to 5 October 2012		16	90	3		2								20	1				1
12 October 2012 to 18 October 2012		7	337	8										21	30				

2.4.191 High numbers of common pipistrelles were recorded at this Finemere east with a peak count of 337 passes per night. *Myotis* activity was moderate, with peak counts of 21 passes per night (passes per night). Soprano pipistrelles were low to moderate, with a peak count of eight passes per night for soprano pipistrelles (compared with 42 at Finemere west). No noctules were recorded at Finemere east (compared with 46

<sup>13</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI – Leisler's bat, Es - serotine bat, Ny/Ep - Nyctalus/ Eptesicus bat.

passes per night at Finemere west). The number of peak passes per night for brown long-eared bats however, was significantly higher with 30 passes per night.

Table 55: Summary of static detector monitoring results for o20-BA2-074-001

Ecology survey code	Location	OS Grid		Description of habitat														
o20-BA2-074-001	Finemere west	SP 710 219		Arable field with well-connected hedgerows, with a railway running to the south and ancient SSSI woodland to the north.														
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring <sup>14</sup> [insert the highest number of bat passes recorded on any one night during deployment]																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Ep
27 June 2012 to 5 July 2012	9	20	1		2						4					2		
25 July 2012 to 6 August 2012	13	268	10		41							35						1
22 August 2012 to 5 September 2012	15	160	11		72							9			2	1	1	4
20 September 2012 to 3 October 2012	14	137	5		33							67						2
12 October 2012 to 26 October 2012	15	335	20		1							8	6			1	1	

2.4.192 Low to moderate levels of activity of pipistrelles were recorded at Finemere west with a peak count of 335, this number was very similar peak count to the Finemere east which had 337 passes per night for the same time period. Other months saw very similar levels across the two static detector locations such as August peak count at Finemere west which was 268 passes per night and at Finemere east where there were 274 passes per night. Moderate to high levels of *Myotis* species were also recorded with a peak count of 67 passes per night with low numbers of soprano pipistrelles, noctules, Leisler's and serotines recorded with peak counts of 11, one, two, one respectively. Unspecified large bat calls had a peak count of four passes per night. Calls from undetermined pipistrelles species were similar across the locations with a peak count at

<sup>14</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI – Leisler's bat, Es - serotine bat, Ny/Ep - Nyctalus/ Eptesicus bat.

Finemere east of 111 passes per night and at Finemere west of 72 passes per night, but the *Myotis* and large bat calls were significantly higher at Finemere west with a peak count of 67 passes per night than Finemere east with 21 passes per night peak count.

### *Static detector monitoring results for the Bernwood Arrays*

2.4.193 Detectors were placed out at four static locations and then two further floating locations at other points of interest between the static locations. The term floating array was utilised to further sample areas which appeared to have high levels of activity to gain further insight in to the bat assemblage and intensity of use at these area. The locations were set up between the southerly part of the Fishing Lakes near Edgcott road, and the cross section directly south of Sheephause Wood and Calvert Landfill site.

Table 56: Summary of static detector monitoring results for o20-BA2-074-076- North Mega Ditch south of Calvert Landfill Site

Ecology survey code	Location	OS Grid		Description of habitat													
o20-BA2-076-001	Array 1: North Mega Ditch south of Calvert Landfill Site	SP 702 227 (Left) SP 703 338 (Right)		Semi-improved grassland with willow scrub and tall ruderal vegetation bordered by water bodies and a railway.													
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring <sup>15</sup>														
			Pp	Ppy	Pn	P sp.	Mb	Md	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Nyctalus
16 May 2013 to 23 May 2013 (Left Mic)	7	661	162								67						464
16 May 2013 to 23 May 2013 (Right Mic)	7	591	47								39						294
13 June 2013 to 20 June 2013 (Left Mic)	7	1274	58	28							32						108
13 June 2013 to 20 June 2013 (Right Mic)	7	306	29	14							32						47
23 July 2013 to 30 July 2013 (Left Mic)	7	468	52	83							159						95
23 July 2013 to 30 July 2013 (Right Mic)	7	776	54	69							71						104
30 July 2013 to 6 August 2013 (Left Mic)	7	495	37	2							28						20
30 July 2013 to 6 August 2013 (Right Mic)	7	202	33	2							45						55

<sup>15</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI – Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

2.4.194 High numbers of both common and soprano pipistrelles were recorded throughout 2013 at this location with a peak count of 1,274ppn for common pipistrelles and 162 soprano pipistrelle. High numbers of *Myotis* and *Nyctalus* species were recorded consistently through the season with this area recording peak counts of 159 *Myotis* ppn and 464 *Nyctalus* ppn. Moderate numbers of Natusius' pipistrelles were recorded at this location a peak count of 83ppn.

Table 57: Summary of static detector monitoring results for 020- BA2-076-002- Floating Array between array 1&amp;2

Ecology survey code	Location	OS Grid	Description of habitat														
020- BA2-076-002- floating Array between Array 1&2	Floating Array between Array 1&2 between the railway and Mega Ditch	SP 702 227 (Left)	Semi-improved grassland with willow scrub and tall ruderal vegetation bordered by water bodies and a railway.														
		SP 702 228 (Right)															
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring															
Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm	M /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Nyctalus
6 June 2013 to 13 June 2013 (Left Mic)	7	639	166	1							16						431
6 June 2013 to 13 June 2013 (Right Mic)	7	503	9	1							14						401
26 June 2013 to 2 July 2013 (Left Mic)	6	308	121	1							200						52
26 June 2013 to 2 July 2013 (Right Mic)	6	335	111								165						93

2.4.195 High numbers of common and soprano pipistrelles were recorded at this location with a peak count of 639 common pipistrelles ppn and 166 soprano pipistrelles ppn. The number ranged between 200-1,200ppn throughout the survey sampling season, which was similar to Array 1 located approximately 50m away to the south. Soprano pipistrelles were recorded with equally high peak counts at both locations, with 166ppn at this floating array and 162ppn at Array 1. During the other recording periods, however, this location consistently recorded higher numbers of soprano pipistrelles than the detector at Array 1. Similar *Nyctalus* activity was recorded at both locations, recording high numbers of *Nyctalus* with a peak count of 431ppn at this floating array between Arrays 1 and 2 and 464ppn at Array 1. *Myotis* activity was high, with a peak count of 200ppn at this location compared with a peak count 152ppn at Array 1.

Table 58: Summary of static detector monitoring results for 020-BA2-076-001 Array2- South Mega Ditch north of Benfield's overbridge

Ecology survey code	Location	OS Grid		Description of habitat															
020-BA2-075-001	Array2-South Mega Ditch north of Benfield's overbridge	SP 706 223 (Left Mic) SP 706 223 (Right mic)		Semi-improved grassland with willow scrub and tall ruderal vegetation bordered by water bodies and a railway.															
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring <sup>16</sup> [insert the highest number of bat passes recorded on any one night during deployment]																
Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	M m/ M b	M sp.	Pa	Bb	Nn	NI	Es	Nyc talus			
13 May 2013 to 21 May 2013 (Left Mic)	8	834	7	49	93		4	1		9		4			11	3		1	
13 May 2013 to 21 May 2013 (Right Mic)	8	433	2	18	37		3			5		4			5	2	1	3	
14 June 2013 to 19 June 2013 (Left Mic)	5	865	114		19							16			6			21	
14 June 2013 to 19 June 2013 (Right Mic)	5	192	2									13						4	
9 July 2013 to 16 July 2013 (Left Mic)	7	1158	38									23						9	
9 July 2013 to 16 July 2013 (Right Mic)	7	67	13									11						13	

2.4.196 Moderate levels of bat activity were recorded at this location, with rare species including Natusius' pipistrelles, and *Myotis* species and less common species including Leisler's having moderate to high levels of activity. Peak counts were recorded of 1,158ppn for common pipistrelles, 114 soprano pipistrelle passes per night, 49 Natusius' pipistrelles passes per night, 23 passes per night of *Myotis* species, and a peak count of *Nyctalus* species of 21 passes per night. Occasional serotine passes were also recorded at this location and Leisler's calls were isolated from the *Nyctalus* calls, of which there was peak in May with a peak count of three ppn.

<sup>16</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Natusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI – Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

Table 59: Summary of static detector monitoring results for 020-BA2-075-001-Array 3

Ecology survey code	Location	OS Grid	Description of habitat																
020-BA2-075-003- Array3	Array 3 – where the Akeman street disused railway and the current railway meet between Grendon Junction and Benfield's green overbridge	SP 710 219 (Left) SP 710 219 (Right)	Arable and pasture land with fragmented planted and semi natural woodland and scrub located between the railway and Akeman street disused railway.																
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring <sup>17</sup> [insert the highest number of bat passes recorded on any one night during deployment]																
Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	Nl	Es	Nyctalus			
29 May 2013 to 5 June 2013 (Left Mic)	7	254	23							15							14		
29 May 2013 to 5 June 2013 (Right Mic)	7	55	2	1						7							9		
5 June 2013 to 12 June 2013 (Left Mic)	7	327	14							17							52		
5 June 2013 to 12 June 2013 (Right Mic)	7	52	2							11							32		
23 July 2013 to 30 July 2013 (Left Mic)	7	177	7	6						20							9		
23 July 2013 to 30 July 2013 (Right Mic)	7	11	2	17						3							3		
30 July 2013 to 7 August 2013 (Left Mic)	8	249	20	2						8							65		
30 July 2013 to 7 August 2013 (Right Mic)	8	59	3	6						5							4		

2.4.197 Moderate to high numbers of common pipistrelles were recorded at this location with peak counts of 249ppn, and a peak count of 23ppn for soprano pipistrelles. *Myotis* and *Nyctalus* species were also recorded in low to moderate numbers with a peak count of 20ppn for *Myotis* and ppn for *Nyctalus*.

<sup>17</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl – Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

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Table 6o: Summary of static detector monitoring results for o2o-BA2-floating between arrays 3 & 4 at Grendon Junction

Ecology survey code	Location	OS Grid	Description of habitat															
o2o-BA2-075-004	Floating Array between arrays 3 & 4 at Grendon Junction	SP 710 218 (Left) SP 710 218 (Right)	Arable and pasture land with fragmented planted and semi natural woodland and scrub located between the railway with Akeman Street disused railway.															
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring <sup>18</sup>																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	
6 June 2013 to 13 June 2013 (Left Mic)	7	721	71		3							8			3			3
6 June 2013 to 13 June 2013 (Right Mic)	7	153			14							3		1	6			3

2.4.198 This location is approximately 50m further south from Array 3 by Akeman Street disused railway. High numbers of common pipistrelles and moderate numbers of soprano pipistrelles were recorded at this location with peak nightly counts of 721 and 71ppn respectively. However, generally fewer *Myotis* species and *Nyctalus* species were recorded at Grendon junction compared to the static detector located by the railway and Akeman Street disused railway. Peak counts of 8ppn and 3ppn were recorded at Grendon Junction compared to 20ppn for *Myotis* and 65ppn for *Nyctalus* species. However one barbastelle call was recorded at this location in June, which was within 500m of the location where the barbastelle was trapped and radio-tagged.

<sup>18</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/Brandt's bat, M sp. - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI – Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/Eptesicus* bat.

Table 61: Summary of static detector monitoring results for o20-BA2-Array4 Woodlands Farm Fishing Lakes

Ecology survey code	Location	OS Grid		Description of habitat														
o20-BA2-074-002	Array 4 Woodlands Farm Fishing Lakes- based along the hedgerow to the south of the lakes	SP 713 215 (Left mic)	SP 713 215 (Right mic)	Fishing lakes located south of Finemere SSSI semi natural woodland bordered by improved grassland and arable fields.														
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring: 1470 common pipistrelles passes were recorded																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Ep
30 May 2013 to 6 June 2013	7	1470	220	3								123						104
19 June 2013 to 27 June 2013	7	659		109	10							82						65
16 July 2013 to 23 July 2013	7	1096	62									92						39

2.4.199 This site recorded some of the highest levels of common pipistrelle activity with a peak count of 1,470ppn. The next highest array in terms of passes per night was Array 1 located in the north of the Mega Ditch which recorded a peak count of 1,274ppn from common pipistrelles and 162ppn from soprano pipistrelles. High numbers of *Myotis* calls were recorded at this location with a peak count of 123ppn, this number was slightly lower when compared with the *Myotis* peak count of 162ppn at Array 1. Additionally, moderate to high numbers of Nathusius' pipistrelles were recorded at this location with a peak count of 109ppn. This was higher when compared with other static detector locations in Bernwood forest area where the location. Nyctalus activity was high in this location as well, but much lower than the records at Array 1, with a peak count of 104ppn compared with 464ppn at the location of Array 1.

## Discussion

### Bat Assemblage

2.4.200 Thirteen of the 17 breeding bats found in the UK have been recorded during field surveys within the area of the Proposed Scheme. Most notably this includes one very rare species, four rare and scarce and uncommon species<sup>2</sup>. The very rare species is the Bechstein's bat, the rare species are; the barbastelle bat, *Nathusius' pipistrelle*, whiskered and Brandt's bat. The scarce and uncommon species were; serotine, noctule and Leisler's bats. All were found predominantly in and around Bernwood forest between Calvert and Quainton and the Waddesdon areas.

2.4.201 The common and widespread species, common and soprano pipistrelles, brown long-eared bats, Daubenton's and Natterer's were found throughout the area, but the highest roost numbers and activity was concentrated around the Bernwood forest area between Calvert and Quainton.

2.4.202 Desk study records from the North Buckinghamshire and Berkshire Bat Group (NBBG) concurred with the presence of twelve species recorded during these field surveys. The exception was of records for Leisler's bats, which was first trapped during surveys for this project.

### Roosts

2.4.203 A total of 92 roosts were identified from initial assessments, activity surveys and radio-tracking surveys. Of these, 86 roosts were identified from radio-tracking surveys and are discussed separately below. The following discussions of radio-tracking data (they are divided into Bechstein's, barbastelle and less common species). Of the six roosts identified through building and tree surveys, four were found within buildings at two sites and two roosts were identified in two trees at one site. Of the two tree roosts, one was a soprano pipistrelle roost and the other was a whiskered bat roost. Both tree roosts consisted of low numbers of bats with one to two individuals seen emerging from these roosts. The four roosts located in buildings, were at two sites; at residential building to the east of Lower Blackgrove Road which had a common pipistrelle maternity roost (with approximately 10 individuals) and brown long-eared day roost (with one individual seen emerging). The other two building roosts were located to the east of Grendon Junction, and consisted of a probable brown long-eared maternity roost and a common pipistrelle roost of one bat.

2.4.204 Given the number of roosts identified and the rare status of some species identified, the following paragraphs have been divided in to Bechstein's, barbastelle, less common species (including other *Myotis* and *Nyctalus* species) and common and widespread roosting species.

### Bechstein's bat roosts

2.4.205 Most notably this area contained large numbers of Bechstein's roosts with 23 individual roosts being identified in 2013. The Bechstein's roosts identified from radio-tracking surveys were part of the three separate colonies; located in Finemere Woods, a maternity colony (containing at least nine roosts), Sheephause Woods and Grendon and Doddershall Woods. Bechstein's bats are a rare species in the UK and are also rare and vulnerable at the European level. The maternity colony in Finemere Woods

comprises 19 of the Bechstein's roosts, two roosts were located in Greatsea/Romer Woods which are in close proximity to Finemere Woods and are connected with hedgerows<sup>19</sup>. Bechstein's bats are very rare bats with restricted UK distributions and are on the edge of their UK and European range. Consequently, maternity colonies of these bats are uncommon and are important to maintain the UK population of Bechstein's bat.

2.4.206 Desk study records further confirm the colony within Grendon and Doddershall Woods is a maternity roost. Desk study records indicate a further seven roosts within the Bernwood forest area, all located within Finemere, Greatsea and Romer Woods (included as part of the Finemere maternity colony), Sheephause Wood and Ham Green Wood.

#### *Barbastelle bat roosts*

2.4.207 One barbastelle roost was located from radio-tracking surveys, this roost was located in a horse chestnut tree in a fragmented ancient woodland on the Waddesdon Manor estate. The roost is located within 1.5km of the land required for construction of the Proposed Scheme the barbastelle, a non-breeding female, was originally caught in Hewin's Wood to the east of Greatmoor Farm.

2.4.208 As discussed in section 1.6.9 access was not permitted to the site which contains the barbastelle roost, this resulted in limited information collected on this roost.

2.4.209 Desk study records for barbastelle bats indicate there several roosts present within Buckinghamshire, however none of these roosts are within 5km of the Proposed Scheme.

#### *Woodland bat roosts*

2.4.210 This area supports roosts of four other *Myotis* species, with roosts of Brandt's, Daubenton's, Natterer's, and whiskered bats being located with a total of 47 roosts from all *Myotis* species recorded from field surveys. These roosts were predominantly located within Finemere Wood, Sheephause Wood and Grendon and Doddershall Woods.

2.4.211 Desk studies verified at least 11 of these roosts and provided records on activity of these species within 1km of the route section. The *Myotis* species roosts found in and around the Bernwood forest with several summer and maternity Daubenton's, Natterer's, whiskered and Brandt's roosts found in Sheephause Wood, Finemere Wood, Finemere Hill, Grendon and Doddershall Woods.

2.4.212 Desk study records further indicated high numbers of roosts and high levels of activity from all the species. Records confirm the following; Natterer's maternity colonies were present in the Bernwood forest area (with nine roosts identified in Finemere alone; two in Grendon and Doddershall Woods); Daubenton's roosts (another

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<sup>19</sup> Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favorable conservation status, introducing robust protection for those habitats and species of European importance.

maternity colony identified in Grendon and Doddershall Woods and Sheephause Wood); and the presence of whiskered and Brandt's colonies in Finemere Woods.

2.4.213 Eighteen brown long-eared roosts were recorded at various locations within Finemere Woods and south of Sheephause Woods, with a large maternity colony identified within Finemere Woods using several bat boxes and adjacent trees from field surveys.

2.4.214 Desk study data had records for approximately 19 brown long-eared bat roosts, four of which were the same as the roosts located through field surveys.

### *Nyctalus and Eptesicus bat roosts*

2.4.215 A noctule roost was identified within Grendon and Doddershall Woods, the location of which was also verified through desk study records.

2.4.216 Field studies were not able to determine the radio-tracked Leisler's bat roost location due to constraints discussed in Section 1.6, it is therefore likely that this species does not roost within the immediate vicinity of the Proposed Scheme. No serotine bats were caught and radio-tracked or roosts identified. The only known roost of serotines was identified through desk study records and is located within 1km of land required for the Proposed Scheme in Waddesdon. A further desk study record indicates the presence of a Leisler's bat in Grendon and Doddershall Woods which is 1.2km from the route.

### *Common and soprano pipistrelle bat roosts*

2.4.217 Three common pipistrelle roost and four soprano pipistrelles roosts were located along near the Aylesbury Link Railway in residential buildings and within Finemere Woods and in a residential property on Station Road. Of these roosts, six contained breeding females and are likely to be maternity roosts.

### *Foraging*

2.4.218 The Bernwood forest area generally recorded high levels of activity from common, soprano and moderate levels of Nathusius' pipistrelles, *Myotis* species and *Nyctalus* species with occasional barbastelle and serotine records. The highest activity levels were generally recorded in the north of the area (the north side of the Mega Ditch at Greatmoor Farm between the Mega Ditch and the railway directly south of Calvert Landfill and Sheephause Wood) with decreasing activity moving south towards Grendon Junction (high levels of activity were recorded here, but the activity was less compared with the most northerly static detector recording locations). The activity increased again in the most southerly location at Finemere fishing lakes.

### *Bechstein's bat foraging habitat*

2.4.219 Radio-tracking studies identified foraging areas associated with roost locations at Finemere Woods (including Greatsea and Romer Woods), Sheephause Woods, and Grendon and Doddershall Woods. Other areas included the westerly hedgerow at Finemere Woods, and the area adjacent to the railway between Grendon Junction, Akeman Street disused railway and the Calvert Landfill. Foraging activity whilst mostly located within woodlands was not limited to this habitat type.

### *Barbastelle bat foraging habitat*

2.4.220 Radio-tracking data showed the barbastelle foraging along the Akeman Street disused railway. Additionally barbastelle calls were recorded at Grendon Junction, FCC Environment waste facility and Fleet Marston Spinney (which is in the north of CFA11 with a roost located at Waddesdon and contains fragments of ancient and semi natural planted woodland).

### *Nathusius' pipistrelle bat foraging habitat*

2.4.221 Static monitoring surveys along and adjacent to the Aylesbury Link railway line recorded moderate levels of Nathusius' pipistrelle activity, in particular at the most northerly point of the Mega Ditch to the south of the Calvert Landfill Site and at the Finemere fishing lake. Nathusius' pipistrelles are rare and therefore recording high levels of activity at this location (a peak nightly count at Finemere fishing lakes of 109 passes per night) is likely to be replicated at few other sites in Buckinghamshire. Therefore this area is likely to be important in maintaining the population of Nathusius' pipistrelles.

### *Woodland bat species foraging habitat*

2.4.222 Activity levels were noted to be high with in the woodlands; Finemere Wood and Sheephause Wood during trapping surveys. With multiple brown long-eared bat roosts, Daubenton's bat and Natterer's bat roosts present in Finemere Wood and Sheephause Wood, much of the foraging of these species were confined to these and surrounding woodlands. However other areas also recorded high levels of activity from *Myotis* species.

2.4.223 The highest levels of activity were located in the area between Greatmoor Farm, the Mega Ditch and the railway directly south of Calvert Landfill Site. Peak counts of over 1200 and 220 passes of common and soprano pipistrelles were recorded. Additionally *Myotis* species were recorded in high numbers with peak counts of 200 and 464 passes. These activity levels were similar in the floating array static recording location further south approximately 50m away from Array 1 at the north of the Mega Ditch.

2.4.224 Foraging activity was particularly prevalent at the north and south of the Mega Ditch, along the Finemere Wood hedgerows to the east and west, at Finemere fishing lakes and at Benfield's overbridge. These areas recorded high peak counts *Myotis* species, most likely Daubenton's from trapping surveys conducted were recorded at Finemere fishing lakes. This indicates that these areas are important in supporting a high diversity of bat assemblage and large populations of these species.

### *Nyctalus and Eptesicus bat species foraging habitat*

2.4.225 Radio-tracking studies recorded noctule bat breeding, roosting and foraging habitat in Grendon and Doddershall Woods. High numbers of *Nyctalus* species calls were recorded at the Mega Ditch, along the Finemere Wood hedgerows to the east and west, at Finemere fishing lakes and at Benfield's overbridge. The highest levels of activity were located in the area between Greatmoor Farm, the Mega Ditch and the railway directly south of Calvert Landfill site. Peak counts of *Nyctalus* species were recorded in high numbers with peak counts of 200 and 464 passes. These activity

levels were similar in the floating array static recording location further south approximately 50m away from Array 1 at the north of the Mega Ditch.

2.4.226 One Leisler's bat was radio-tagged on the existing railway line adjacent to Calvert Jubilee (CFA13) and subsequently recorded foraging in that area. High numbers of Nyctalus species were recorded at all six static detectors locations in this section, the highest activity was directly to the south of Calvert Landfill Site and Sheephause Wood and westerly hedgerow connecting Finemere Wood with the existing railway line. Data from transect surveys confirmed the presence of serotine bat foraging adjacent to the railway line between Greatmoor Farm and Sheephause Wood. There are very few records for Leisler's bat in Buckinghamshire and the presence of these three species as part of the wider assemblage of bats present in this area is noteworthy.

2.4.227 Field studies were unable to determine the location of the Leisler's roost, suggesting it is not within close proximity of the Proposed Scheme. Leisler's were trapped at a site between Grendon Junction and Calvert Landfill Sites and recorded foraging along the Mega Ditch. The static detector surveys recorded the Leisler's bats using the area along the Mega Ditch to forage. Leisler's bats are classified as less common species have not been recorded within the county previously. Therefore this habitat around the Mega Ditch is important to retain the population of Leisler's within the wider area.

#### *Common and soprano pipistrelle bat foraging habitat*

2.4.228 Radio-tracking studies identified maternity colonies of common pipistrelle in the underbridge of the existing railway embankment immediately north of the River Ray, and a further maternity roost at a residential property adjacent to Buckinghamshire Railway Centre. Low numbers of roosting bats were recorded in trees at Greatmoor Farm (up to three individuals emerged from each roost), adjacent to the Mega Ditch and existing railway corridor vegetation. Similar peak counts of pipistrelles calls between Finemere west and Finemere east static detector locations on the same months indicate the area along the hedgerows and railway where the detectors were located is an important foraging a site for this species

2.4.229 Additionally, high numbers of common and soprano pipistrelles were recorded at Finemere fishing lakes. Foraging activity was particularly prevalent at the north and south of the Mega Ditch, along the Finemere Wood hedgerows to the east and west, at Finemere fishing lakes and at Benfield's overbridge.

#### *Commuting*

2.4.230 Well-connected hedgerows, Akeman Street disused railway, the Quainton railway and overbridges, fragmented woodland and the tributaries of the River Ray provide an extensive network of commuting features which support high numbers and diversity of bats.

2.4.231 Generally the key areas of commuting were identified around Bernwood forest through radio-tracking, static monitoring, activity transect and paired sampling surveys. These include the Aylesbury Link Railway, the Mega Ditch and bridle ways at Grendon Junction and Benfield's overbridge leading into Hewin's Wood. These

features are of specific importance as they connect the network of maternity colonies found in Finemere Wood, Sheephause Wood and Grendon and Doddershall Woods.

### *Bechstein's commuting habitat*

- 2.4.232 The three Bechstein's colonies, are connected by well used commuting routes including the railway and the Mega Ditch which connects Finemere Woods and Sheephause Woods, the hedgerows leading south at the eastern and western elevations at Finemere Woods, Benfield's overbridge, Grendon junction and Hewin's Wood leading from Finemere Woods to Grendon and Doddershall Woods.
- 2.4.233 Radio-tracking surveys recorded Bechstein's bats crossing the Proposed Scheme at Benfield's overbridge and using the vegetation along the Aylesbury Link railway line to commute to foraging habitat in Sheephause Wood. They cross the Proposed Scheme at Grendon Junction when commuting to and from Grendon and Doddershall Woods, and use an existing hedge to commute to Finemere Wood and nearby woodland further north. They commute from Grendon and Doddershall Woods to Sheephause Wood along the Edgcott Road and trackside vegetation and watercourses in the Calvert Landfill Site. They use the Aylesbury Link railway to commute south from Finemere Woods towards Edgcott Road.
- 2.4.234 To the north east of the Proposed Scheme Bechstein's bat were also recorded using hedgerows and tree lines as a flightline to commute from Finemere Wood to Greatsea, Romer, Balmore, Runts and Sheephause Wood. Bechstein's bat are a specialist of woodland habitats<sup>20</sup> and, therefore, other small areas of habitat, such as watercourses, hedgerows, and treelines that provide connectivity between large woodland blocks are considered likely to be important to maintaining conservation status of the population.

### *Barbastelle commuting habitat*

- 2.4.235 Radio-tracking data showed the barbastelle commuting along the Akeman disused railway, small numbers of calls were recorded at Grendon junction and at the Floating arrays indicating that barbastelle bats occasionally use the area around there and the Mega Ditch for commuting. Given the rare status of this species commuting routes such as these which leads directly to the roost are important in maintaining connectivity between roosts and foraging areas.

### *Commuting of Natusius' pipistrelle*

- 2.4.236 Natusius' pipistrelles activity was recorded between all the static monitoring locations of the Bernwood arrays with moderate levels recorded at the lake at Calvert Landfill Site and the Fishing Lake. Lower levels of constant activity throughout the season were recorded at the other static monitoring locations including the floating array between locations 3 and 4 at Grendon Junction, Akeman Street Disused Railway and Benfield's overbridge. This indicates Natusius' pipistrelles use these area for commuting along these features and the Mega Ditch in order to get to foraging grounds at Calvert Landfill site and the Fishing lakes. Areas such as these are unlikely

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<sup>20</sup> Hill, D A, & Greenaway, F. (2006), *Putting Bechstein's bat on the map. Final Report to Mammals Trust UK*. London.

to be found elsewhere in the county and are therefore likely to be important in maintaining the commuting and foraging populations of *Nathusius' pipistrelles*.

### *Commuting habitat routes of woodland species*

2.4.237 The vegetation along the Aylesbury Link railway and nearby woodland, as well as adjoining hedges, scrub and water bodies provide commuting habitat for an assemblage of woodland bat species. Maternity colonies of Daubenton's, brown long-eared, Natterer's, whiskered, Brandt's bats have all been recorded in the larger areas of woodland, with smaller roosts brown-long eared and whiskered bat present in vegetation along the Aylesbury Link railway and adjacent bridleway. These species use a range of features as commuting habitat including the Aylesbury Rail link between Edgcott Road and Calvert Jubilee nature reserve in Calvert and Chetwode (CFA13), the Muxwell Brook and Mega Ditch, and the Akeman Street disused railway. Key crossing points of the Proposed Scheme were identified and are as follows; Adam's Road underbridge, at Grendon Junction, Benfield's overbridge, and to the south of Sheephouse Wood and various points along the wood's western boundary. Daubenton's, Natterers', brown long-eared, whiskered and Brandt's bats are frequently associated with woodland and maternity roosts of these species are therefore important to maintain the unusually diverse assemblage and strong populations of woodland bats. Whiskered and Brandt's are considered to be rare species and their presence as part of the recorded assemblage is notable.

2.4.238 Moderate numbers of bat calls were recorded at Finemere east (21 passes per night peak count) and high numbers at Finemere west (67 passes per night peak count). The consistent variation between the number of *Myotis* calls per night between these locations from 2012 data indicate *Myotis* bats cease to follow this hedgerow and are likely to commute in to Finemere Woods or the lakes to forage. Indicating this hedgerow is an important commuting route for these species.

*Commuting of Nyctalus and Eptesicus species*

2.4.239 Field surveys recorded *Nyctalus* species use the area directly adjacent to the railway at Benfield's overbridge and Grendon Junction for commuting, along as less passes per night were recorded indicating these species were moving between foraging locations and roosts. Finemere east only recording one pass of a serotine in September 2012. Leisler's bats were also recorded at Finemere west. The roost of the radio-tagged Leisler's bat was not located and radio-tracking data for this bat was intermittent. Indicating the area along the railway near Calvert Landfill site is used for commuting by Leisler's bats within this area. Recording calls in this area supports the evidence that Leisler's bats may use this area occasionally. Additionally activity of the large bats activity was different between the recording locations with Finemere east location recording much fewer larger bats, Finemere west recording low numbers of passes per night consistently throughout the season indicating this hedgerow is important for commuting *Nyctalus* species.

2.4.240 Desktop study records for Leisler's bats in this area are limited and no roosts have been located indicating this area is important for commuting of these species between foraging habitat and roosts.

### *Commuting of common and soprano pipistrelles*

2.4.241 Bats use the existing rail corridor as a commuting route, travelling to foraging sites in Sheephouse Wood and Finemere Wood. A maternity colony of soprano pipistrelle was recorded north of Edgcott Road approximately 50m west of the land required, and another was 1km to the east. Soprano pipistrelles are also considered likely to commute extensively along the existing railway corridor as they roost close to common pipistrelle colonies and have similar commuting routes in elsewhere in this area. The presence of maternity roosts of this size in close proximity to areas used for foraging will be integral to maintaining populations over extensive areas

### **CFA13 Calvert, Steeple Claydon, Twyford and Chetwode**

#### *Overview of bat species status in the vicinity of CFA13*

2.4.242 Land in and adjacent to the Proposed Scheme offered suitable habitat for roosting, foraging and commuting bats. This included arable fields, improved pasture, small areas of semi-improved grassland and an extensive network of intact hedgerows. A complex of ancient woodlands collectively known as the Bernwood Forest is present in the south of this area and to the north of Waddesdon & Quainton (CFA12). A disused railway runs parallel to the land required for the construction of the Proposed Scheme throughout the area. Aquatic habitats include an expanse of open water at Calvert Jubilee Nature Reserve LWS, Padbury Brook and its tributaries, several drainage channels, and ponds.

2.4.243 Two seasons of radio tracking studies were undertaken over the land between north of Station Road, Quainton (CFA12) and Calvert Jubilee LWS in CFA13, to gain a better understanding of how bats use the landscape crossed by the Proposed Scheme for foraging and roosting. All results discussed in this report refer to findings within CFA13 except where for clarification purposes it is necessary to refer to CFA12. For example, commuting routes and foraging grounds may cross over the two CFA boundaries, and situations where this happens are made clear within the text.

2.4.244 The presence of twelve species was confirmed in this area through field surveys, this includes Bechstein's bats which are near threatened at the European level<sup>21</sup> and the populations found in this area are on the edge of the UK range. The assemblage also comprises Nathusius' pipistrelles which are classified as rare and Leisler's bats are classified as a scarce species<sup>22</sup> and Nathusius' pipistrelle is a rare bat which is uncommonly found in this area. The presence of these species in the area has also been established through desk study records.

2.4.245 The full complement of species confirmed in this area is as follows:

- common pipistrelle (*Pipistrellus pipistrellus*);

<sup>21</sup> Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favorable conservation status, introducing robust protection for those habitats and species of European importance.

<sup>22</sup> Bat Conservation Trust (2012). The state of the UK's bats: National Bat Monitoring Programme Population Trends 2012, BCT, London  
3. (Hill, D A, & Greenaway, F. (2006), Putting Bechstein's bat on the map. Final Report to Mammals Trust UK, London.

<sup>22</sup> Bat Conservation Trust (2012), The state of the UK's bats: National Bat Monitoring Programme Population Trends 2012, BCT, London.

- soprano pipistrelle (*Pipistrellus pygmaeus*);
- Natusius' pipistrelle (*Pipistrella nathusii*);
- Bechstein's bat (*Myotis bechsteinii*);
- Daubenton's bat (*Myotis daubentonii*);
- whiskered bat (*Myotis mystacinus*);
- Brandt's bat (*Myotis brandtii*);
- Natterer's bat (*Myotis natterii*);
- noctule bat (*Nyctalus noctula*);
- Leisler's bat (*Nyctalus Leisleri*);
- serotine bat (*Eptesicus serotinus*); and
- brown long-eared bat (*Plecotus auritus*).

### *Roosting (Trees)*

2.4.246 A total of 192 trees were subject to an initial assessment in-line with the methods described in the Field Survey Methods and Standards (FSMS). These included ground based survey, subsequent climbed inspections and, where appropriate, emergence surveys.

2.4.247 The figures stated below do not include information on roosts obtained from radio-tracking and trapping. Information collected from radio-tracking is discussed separately.

2.4.248 The initial and subsequent inspections of the 192 trees identified:

- five confirmed tree roosts (which comprised three common pipistrelle roosts, a brown long-eared and a *Myotis* roost - see Table 62)
- 28 trees having high potential to support roosting bats;
- 83 trees having moderate potential to support roosting bats; and
- 76 trees as having low or negligible potential to support roosting bats. These trees were subsequently scoped out of further survey.

2.4.249 Of the 116 trees with confirmed roosts, or assessed as having high or moderate potential to support roosting bats, 111 trees were subject to a detailed inspection in the form of a tree climbing survey.

2.4.250 As discussed in Section 1.3.1 and 1.3.2 not all the trees were climbed because of health and safety concerns and intermittent access granted to the sites. As a result five trees assessed as having high or moderate potential were not climbed.

2.4.251 None of the trees climbed were subsequently reassessed as being of low or negligible potential to support roosting bats.

2.4.252 Of the 111 trees subject to climbing surveys, a total of 118 emergence surveys were subsequently carried out on 44 of these trees. 67 trees were not subject to emergence surveys because of the reasons discussed in Section 1.4.1 and Section 1.4.2.

2.4.253 One roost was confirmed through tree climbing inspections and four were identified from emergence surveys.

2.4.254 Details of confirmed tree roosts in this area of the route are provided in Table 1.

2.4.255 In addition to the field survey records, desk study records include two Bechstein's bat roosts within 500m of the land required for construction of Proposed Scheme. Desk study records also include a Natterer's bat roost within 1 km of the Proposed Scheme, a Leisler's roost in Grendon and Doddershall woods within 1.2km, and several Daubenton's roosts in Sheephause Wood adjacent to the Proposed Scheme.

Table 62 Confirmed tree roosts within CFA13

Ecology survey code	Location	OS grid reference	Tree species	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CF A	Approximate distance from the Proposed Scheme
020-BA4-078-004	Claydon Estate	SP 691243	Tree	Common pipistrelle	Aug-13	Maternity		13	Within the Proposed Scheme
020-BA4-078-008	Deycopond Wood	SP 695240	Tree	Daubenton's bat	Jul-13	Not applicable		13	Within 60m of the Proposed Scheme
020-BT2-079-002	Calvert Jubilee LWS	SP 681 250	Blackthorn	<i>Brown long-eared bat (3 droppings)</i>	22 April 2013-Tree climbing	Day	Goes up 30cm into narrow crevice.	13	Within 80m of the Proposed Scheme
020-BT3-080-087	Elm Tree Farm	SP 681 256	Pedunculate Oak	<i>Common pipistrelle (3-4 droppings)</i>	5 June 2013 Tree climbing	Day	Cavity going up.	13	Within the Proposed Scheme
020-BT3-080-089	Elm Tree Farm	SP 679263	Willow	<i>Myotis sp (1)</i>	5 June 2013 Tree climbing	Day	Woodpecker hole	13	Within the Proposed Scheme
020-BT3-085-004	Sunflower Farm	SP 641 292	Horse Chestnut	<i>Common pipistrelle (5)</i>	5 May 2013 Tree climbing	Day	Split in overhanging limb	13	Within 5m of the Proposed Scheme
020-BT3-	Calvert Jubilee	SP 687	Pedunculate	<i>Common</i>	30 April 2013	Day	Creviced split from a	13	Within 40m of

Ecology survey code	Location	OS grid reference	Tree species	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
078-001	LWS	245	Common Oak	<i>pipistrelle</i>	Tree climbing		callus role, south east facing		the Proposed Scheme

### *Roosts (Radio-tracking)*

2.4.256 As reported in CFA12, radio-tracking studies in the Bernwood Forest area and desk study data have recorded a population of Bechstein's bat comprising at least three colonies, each including several maternity roosts, either side of the land required for the Proposed Scheme.

2.4.257 A total of 86 roosts of various species were identified through radio-tracking surveys carried out across this area and within Waddesdon and Quainton (CFA12). Of this total, seven roosts were located within CFA13 (see Table 63).

- four roosts were in trees located in Decoy Pond Wood (part of Bernwood Forest complex), three of which were Daubenton's bat roosts and one of which was a Bechstein's roost; and;
- three roosts were located in trees; one near Chetwode and one near the Claydon Estate, both of which were Daubenton's bat roosts, and one near Church Copse which was a common pipistrelle roost.

2.4.258 Details of confirmed roosts in buildings/structures in this area of the route are provided in Table 63.

Table 63 Confirmed roosts located from radio-tracking surveys within CFA13

Ecology survey code	Location	OS grid reference	Tree /Building	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	CFA	Distance from the Proposed Scheme
020-BA4-085-001	Chetwode Manor	SP 640 292	Tree	<i>Daubenton's bat</i>	August 2013	Maternity	13	Within the Proposed Scheme
020-BA4-078-001	Deycopond Wood	SP 694241	Tree	<i>Daubenton's bat</i>	26 September 2012	Maternity	13	Within 5m of the Proposed Scheme
020-BA4-078-001	Claydon Estate	SP 691243	Tree	<i>Common pipistrelle</i>	August 2013	Maternity	13	Within the Proposed Scheme

Ecology survey code	Location	OS grid reference	Tree /Building	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	CFA	Distance from the Proposed Scheme
020-BA4-078-002	Deycopond Wood	SP 696 239	Tree	<i>Bechstein's bat</i>	August 2013	Not applicable	13	Within 25m the Proposed Scheme
020-BA4-078-003	Deycopond Wood	SP 693 240	Tree	<i>Daubenton's bat</i>	July 2013	Maternity	13	Within the Proposed Scheme
020-BA4-078-004	Deycopond Wood	SP 695240	Tree	<i>Daubenton's bat</i>	July 2013	Not applicable	13	Within 60m the Proposed Scheme
020-BA4-086-001	Church Copse	SP 640300	Tree	<i>Daubenton's bat</i>	July 2013	Not applicable	13	Within 105m the Proposed Scheme

\* Roost types not applicable as they were gathered through radio-tracking data and not all roost were fully assessable during the surveys

### *Roosting (building and structures)*

2.4.259 A total of 21 buildings in this area were subject to initial external assessments, of which:

- 19 confirmed roosts were identified through internal inspections and emergence surveys; two of these roosts were located in one building
- no buildings/structures were recorded with high potential to support roosting bats;
- three buildings/structures were recorded with moderate potential to support roosting bats.

2.4.260 Of the 21 building initially inspected 13 sites were subject to further detailed internal inspections, of which 12 were buildings and one was a bridge. At four sites 11 roosts were identified, these sites were; Residential property at Church Street, Twyford; land and buildings at Chetwode; property within Chetwode; and at Stone Court Farm.

2.4.261 From these inspections no buildings/structures were re-assessed as having low potential or were scoped out, and confirmed roosts were identified;

2.4.262 Emergence surveys were undertaken at 11 buildings and one bridge; one building had restricted access. The buildings were subject to a total of 22 emergence surveys and the bridge was subject to two. Restricted access and sub-optimal weather conditions,

as discussed in Section 1.5.1 and 1.5.2 constrained the completion of a full set of emergence surveys across all buildings/structures.

2.4.263 Desk top study records indicate the presence of a Brandt's bat roost and a whiskered bat roost in buildings at Edgcott within 1km of the land required for construction of the Proposed Scheme. Both roosts are likely to be in a building in this vicinity (cannot be ascertained from the six-figure grid references provided). Desk study records further highlighted a soprano pipistrelle maternity roost (of 200 individuals) in a building south of Calvert Jubilee Nature Reserve LWS.

2.4.264 Details of confirmed roosts in buildings/structures in this area of the route are provided in Table 64.

Table 64 Confirmed bat roosts in buildings/structures within CFA13

Ecology survey code	Location	OS grid reference	Building/structure type	Species confirmed utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
020-BS2-082-001	Residential property at Church street, Twyford	SP 665266	Residential	Brown long-eared bat (confirmed by droppings)	28 March 2013 Bat Building Internal	Night	Loose felt, several holes in brickwork, roosting crevices between beams, potential access gap at eaves, gaps under external tiles.	13	Within 75m
020-BS3-082-002	Residential property at Church street, Twyford	SP 665 267	Barn	Common pipistrelle (1)	4 June 2013 Bat Emergence Survey	Day	Under tiles.	13	Within 89m
020-BS3-082-002	Residential property at Church street, Twyford	SP 665 267	Barn	Soprano pipistrelle (1)	4 June 2013 Bat Emergence Survey	Day	Under tiles.	13	Within 89m
020-BS2-085-001	Sunflower Farm	SP 641292	Residential	Brown long-eared bat (confirmed by droppings)	6 February 2013 Bat Building Internal	Day	Apex space.	13	Within 36m
020-BS2-078-001	Brackley Lane	SP 687245	Residential	Pipistrelle sp (confirmed by droppings)	13 March 2013 Bat Building Internal	Day	Under the apex of the roof between the tiles and roof felt.	13	Within 20m
020-BS3-086-001	Land and buildings at Chetwode	SP 640297	Residential	Brown long-eared bat (38)	11 June 2013 Bat Emergence Survey-	Maternity	Traditional stone and brick construction, clay and slate tiled roof. Pitched roofs, multiple dormers. Gaps under fascia, tiles and lead flashing as well as in stonework and soffit.	13	Within 84m

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Ecology survey code	Location	OS grid reference	Building/structure type	Species confirmed utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
020-BS3-086-001	Land and buildings at Chetwode	SP 640297	Residential	Common pipistrelle (70)	11 June 2013 Bat Emergence Survey-	Maternity	Traditional stone and brick construction, clay and slate tiled roof. Pitched roofs, multiple dormers. Gaps under fascia, tiles and lead flashing as well as in stonework and soffit.	13	Within 85m
020-BS3-086-001	Land and buildings at Chetwode	SP 640297	Residential	Soprano pipistrelle (1)	11 June 2013 Bat Emergence Survey	Day	Traditional stone and brick construction, clay and slate tiled roof. Pitched roofs, multiple dormers. Gaps under fascia, tiles and lead flashing as well as in stonework and soffit.	13	Within 85m
020-BS2-085-001	Rosehill Farmhouse	SP 643 289	Residential	Brown long-eared bat (confirmed by droppings)	6 February 2013 Bat Building Internal	Maternity	Visible gaps in felt lining leading to outer roof materials. Light visible from outside at eaves on south and west elevations.	13	Within 13m
020-Bs2-086-003	Property within north Chetwode	SP 638295	Garage	Brandt's bat (confirmed dropping DNA analysis)	12 February 2013 Bat Building Internal	Day	Concrete garage with flat roof and corrugated fibrous roof. Access gaps at edges under the corrugated sheets. One dropping observed, likely to be from a bat flying in rather than roosting.	13	Within 10m
020-BS2-086-002	Property within Chetwode	SP 638295	Barn	Brown long-eared bat (confirmed by approx. 50 droppings)	12 February 2013 Bat Building Internal	Day	Roosting crevices between beams, ridge boards and behind loose felt.	13	Within 20m
020-BS2-086-001	Property within Chetwode	SP 639 295	Residential	Common pipistrelle (40 emerged with over 200 droppings recorded)	12 February 2013 Bat Building	Maternity	Crevices between beams and gable end wall, few gaps under loose felt providing access to external tiles.	13	Within 10m

Ecology survey code	Location	OS grid reference	Building/structure type	Species confirmed utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
					Internal				
020-BS3-086-001	Property within Chetwode	SP 636299	Residential	Common pipistrelle (3)	5 June 2013 Bat Emergence Survey	Day		13	Within 15m
020-BS2-080-001	Stone Court Farm	SP 685265	Residential	Common pipistrelle (single hibernating bat observed)	11 February 2013 Bat Building Internal	Hibernation	L shaped roof void, in two sections with traditional wooden beams and rafters. Crevices between beams and gable wall.	13	Within 25m
020-BS2-080-001	Stone Court Farm	SP 685265	Residential	Brown long-eared bat (confirmed by droppings, approx. 120)	11 February 2013 Bat Building Internal	Day	L shaped roof void, in two sections with traditional wooden beams and rafters. Crevices between beams and gable wall.	13	Within 25m
020-BS2-080-002	Stone Court Farm	SP 685265	Garage	Brown long-eared bat (Confirmed by droppings, approx. 10-20)	11 February 2013 Bat Building Internal	Day/hibernation	Under tiles and felt and several crevices	13	Within 50m
020-BS1-087-001	Land forming Calvert to Rugby railway line	SP 631 306	Bridge	Brown long-eared bat (hibernating bat observed)	26 February 2013 Bat Building External	Hibernation	Crevices between brickwork and mortar	13	Within the Land required for Construction of the Proposed Scheme
020-BS3-085-001	Old Stable Cottage	SP 643289	Residential	Common pipistrelle (1)	6 June 2013 Bat Emergence Survey	Day	Under soffit on east side	13	Within the Land required for Construction of the Proposed Scheme
020-BA4-078-001	Dunsty Hill Farm Buildings	SP 683235	Unknown	Whiskered bat (1)	July 2013 Bat radio-tracking	Day	Day	13	Within 900m

### Bat activity surveys

2.4.265 The following bat species were recorded during the range of bat activity surveys carried out in this area:

- common *pipistrelle*;
- *soprano pipistrelle*;
- *Nathusius' pipistrelle*;
- Bechstein's bat;
- Daubenton's bat;
- whiskered bat;
- Brandt's bat;
- noctule bat;
- Leisler's bat;
- serotine bat; and
- brown long-eared bat.

Table 65: Bat activity surveys conducted within CFA13

Ecology survey code	Transect/Survey location	Number of surveys conducted	First survey date	Final survey date	CFA	Map Reference
020-BA1-089-08001	Calvert Jubilee Nature Reserve LWS	8 (8 nights)	24 April 2013	24 July 2013	13	SP 687 247 to SP 673 264
020-BA2-080 (Floating Array) Location one	Calvert Jubilee Nature Reserve LWS	1 (7 nights)	22 May 2013	29 May 2013	13	SP 682 254
020-BA2-080 (Floating Array) Location two	Calvert Jubilee Nature Reserve LWS	1 (6 nights)	22 May 2013	28 May 2013	13	SP 682 254
020-BA2-079-001	Steeple Claydon	4 (39 nights)	4 June 2013	21 July 2013	13	SP 705 262

Table 66: Bat activity transect survey results - Transect 020-BA1-079-080, Calvert Lakes

Ecology survey code	Transect location				Description of habitats covered by transect																
Visit number and date	Weather conditions				Total species passes during transect survey <sup>23</sup>																
	Temp (°C)	Cloud (0-8) <sup>24</sup>	Rain (0-5) <sup>25</sup>	Wind (0-12) <sup>26</sup>	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Es
Visit 1: Dawn 24 April 2013	11	8	0	1	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visit 2: Dusk 24 April 2013	14	8	0	2	42	18	0	0	0	0	0	0	0	0	1	2	0	4	0	0	0
Visit 3: Dawn 21 May 2013	13	3	0-1	2-3	103	35	1	0	0	0	0	0	0	0	13	0	0	68	0	0	1
Visit 4: Dusk 21 May 2013	10	6	0	1	70	20	5	0	0	0	0	0	0	0	4	0	0	40	0	0	0
Visit 5: Dawn 10 June 2013	7	7-8	0	1	70	15	2	0	0	0	0	0	0	0	1	0	0	4	0	0	0
Visit 6: Dusk 12 June 2013	9	7	0-1	2-4	101	48	9	0	0	0	0	0	0	0	11	0	0	3	0	0	1
Visit 7: Dusk 23 July 2013	21	3	0	2	67	16	11	0	0	0	0	0	0	0	29	0	0	11	1	0	0

<sup>23</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa - brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

<sup>24</sup> Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

<sup>25</sup> Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

<sup>26</sup> Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

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<b>Ecology survey code</b>	<b>Transect location</b>				<b>Description of habitats covered by transect</b>																
020-BA1-079-080-001	From Sheephouse Woods north past Calvert Jubilee Nature Reserve LWS lakes				Transect along bridleway adjacent to Aylesbury Link Railway comprising ancient woodland and pasture.																
<b>Visit number and date</b>	<b>Weather conditions</b>				<b>Total species passes during transect survey<sup>23</sup></b>																
	Temp (°C)	Cloud (0-8) <sup>24</sup>	Rain (0-5) <sup>25</sup>	Wind (0-12) <sup>26</sup>	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Es
Visit 8: Dawn 24 July 2013	16	2	0	1	75	17	3	0	0	0	0	0	0	0	18	0	0	1	0	0	0

2.4.266 Activity transect surveys recorded moderate to high numbers of common and soprano pipistrelle species consistently throughout the season (see Table 66). Noctule activity was high in May with a peak count of 68 passes per night (ppn), whereas lower activity was recorded in April, June and July with between one and 11ppn for these months. Low level *Nathusius' pipistrelle* activity of 1-11ppn was recorded consistently from June to July, with no records in May. *Myotis* activity was generally low to moderate (1-13ppn) throughout the season with peak activity occurring in July (peak 29ppn). There was a single Leisler's record in July.

2.4.267 Activity for all species was concentrated to the south of the transect route, close to the open water at the FCC landfill facility and Calvert Jubilee Nature Reserve LWS. Foraging by common and soprano pipistrelles, noctules and *Myotis* sp. was recorded in this area. Moderate levels of common and soprano foraging activity were recorded in July at the northern part of the transect near Steeple Claydon. The railway and associated bridle ways around Calvert Jubilee Nature Reserve LWS and FCC landfill facility were used as commuting routes. Foraging activity was particularly observed adjacent to the water body in Calvert Jubilee Nature Reserve LWS.

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Table 67: Summary of static detector monitoring results for 020-BA2-080-001 (Floating Array-Location one), Calvert Jubilee

Ecology survey code	Location	OS Grid				Description of habitat																									
020-BA2-080 (Floating Array)	Calvert Jubilee LWS (Location one)	SP 682 254				Positioned in edge habitat between mature semi-natural broadleaved woodland and open mosaic habitat to the north of open water at Calvert Jubilee LWS																									
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring <sup>27</sup>													Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep
22 May 2013 to 29 May 2013	7	39	41	4	0	0	0	0	0	0	0	0	0	52	0	0	184	0	2	1											

Table 68 Summary of static detector monitoring results for 020-BA2-080-001 (Floating Array- Location two), Calvert Jubilee

Ecology survey code	Location	OS Grid				Description of habitat																									
020-BA2-080 (Floating Array)	Calvert Jubilee LWS (Location two)	SP 682 254				Positioned between Calvert Jubilee LWS and the railway bordered by beech scrub and mature semi-natural broadleaved woodland north of Calvert Lake																									
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring <sup>28</sup>													Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep
22 May 2013 to 29 May 2013	7	244	133	1	0	0	0	0	0	0	0	0	0	15	0	0	124	0	0	0											

2.4.268 Activity survey data for Calvert Jubilee Nature Reserve LWS is summarised in Tables 6 and 7. At Calvert Jubilee Nature Reserve LWS an array of two static detectors was placed in two locations and consequently the results are discussed together. Common and soprano pipistrelle activity was moderate to high at Location two (placed between the railway and Calvert Jubilee LWS) with a peak count of

<sup>27</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - *Nathusius' pipistrelle*, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

<sup>28</sup> Pp - common pipistrelle, P py - soprano pipistrelle, Pn - *Nathusius' pipistrelle*, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb - whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

244ppn and 133ppn respectively. Comparatively lower levels of activity were recorded for common and soprano pipistrelles at Location one (this was placed on the edge of Calvert Jubilee Nature Reserve LWS) with peak counts of 39 and 41ppn respectively. Higher levels of *Myotis* sp and noctule activity were recorded at Location one with peak counts of 52 and 184 respectively compared with 15 and 124ppn at Location two. *Nathusius'* pipistrelle passes were recorded at both locations with a peak count of 4ppn at Location two in comparison with one at Location one. High levels of activity from noctule bats was recorded at both locations with a peak of 184ppn at Location one, and 124ppn at Location two. Serotine bats were recorded in low numbers at Location one with a peak count of two passes. Similarly, one *Nyctalus/Eptesicus* pass was recorded at the same location.

Table 69: Summary of static detector monitoring results for 020-BA2-097001- Steeple Claydon

<b>Ecology survey code</b>	<b>Location</b>	<b>OS Grid</b>		<b>Description of habitat</b>															
		SP 705 262.		Placed along disused rail corridor within area of scrub, trees and grassland close to the southwest boundary of Steeple Claydon.															
<b>Date (night monitoring commenced to night monitoring ceased)</b>	<b>Number of nights detector deployed</b>	<b>Species peak night count during monthly monitoring</b>																	
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/ Ep	
4 June 2013 to 23 June 2013 and 28 June 2013 to 30 June 2013	23	89	42	0	46	0	0	0	0	0	0	12	0	0	0	1	1	2	
1 July 2013 to 8 July 2013 and 12 July 2013 21 July 2013	15	100	109	0	90	0	0	0	0	0	0	31	0	0	0	0	1	2	

2.4.269 Table 69 show activity survey data for static detectors at Steeple Claydon. Moderate levels of activity from common pipistrelle, soprano pipistrelle and *Myotis* species passes were recorded. Low levels of activity from serotine, Leisler's and *Nyctalus/Eptesicus* bats was also recorded. Common and soprano pipistrelle and *Myotis* activity was highest in July. Leisler's bats were active in low numbers in June but absent in July. Peak counts of serotines and *Nyctalus/Eptesicus* bats were the same in both June and July with counts of one pass per night for serotine and two for *Nyctalus/Eptesicus*.



## Discussion

### Bat Assemblage

2.4.270 Field surveys confirmed the presence of 11 bat species in this area, including the near threatened Bechstein's bat, rare Nathusius' pipistrelle and less common species (Leisler's bat, and noctule)<sup>29</sup>. Natterer's bat presence in this area was confirmed from desk study records.

2.4.271 Desk study records from the North Buckinghamshire and Berkshire Bat Group (NBBG) further indicate the presence of Bechstein's bat, including a record from Calvert Jubilee Nature Reserve LWS, and other uncommon species including whiskered, Brandt's, Leisler's and noctule bats.

### Roosts

2.4.272 Field surveys identified roosts of eight species within the diversity of habitats in this area these include roosts of the following species; Bechstein's bat, whiskered bat, Brandt's bat, Daubenton's bat, brown long-eared, common and soprano pipistrelle. A total of 30 roosts were recorded in this CFA from building, tree and radio-tracking surveys.

2.4.273 Eight of these 30 roosts were maternity colonies, and included one Bechstein's bat roost, one whiskered bat, one Brandt's and five Daubenton's roosts.

2.4.274 Nineteen roosts were confirmed in buildings and structures in the area. These comprised eight brown long-eared roosts, six common pipistrelle roosts, two soprano pipistrelle roosts, one Brandt's bat roost, and one whiskered bat roost. Two brown long-eared bat maternity roosts both with 20-40 individuals were confirmed in a residential property. Four maternity roosts, three Daubenton's bat roosts and one common pipistrelle roost were located, two in Decoypond Wood, one at Chetwode Manor and one at Claydon estate.

2.4.275 Seven of the roosts, including common pipistrelle day and hibernation roosts, are within the land required for the construction of the Proposed Scheme. Ten roosts are directly adjacent to the land required for the construction of the Proposed Scheme, including two of the brown long-eared maternity roosts, and are therefore likely to be directly affected. A hibernating brown long-eared bat was also found roosting in a bridge within the land required for construction of the Proposed Scheme.

### Bechstein's bat roosts

2.4.276 As reported in Waddesdon and Quainton (CFA12), radio-tracking studies recorded populations of Bechstein's bat. The Bechstein's roosts identified from radio-tracking surveys were part of three separate colonies; roosts were identified in Waddesdon and Quainton (CFA12) in Finemere Woods (a maternity colony containing at least nine roosts); Sheephouse Wood; Grendon and Doddershall woods; and Greatsea and Romer woods. In addition to these roosts, a single male Bechstein's bat was recorded roosting in Decoypond Wood. Desk study records show further single bat roosts for

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<sup>29</sup> Bat Conservation Trust (2012), *State of the UK's bats: National Bat Monitoring Programme Population Trends 2012*. JNCC. Peterborough.

Bechstein's in both Sheephause Wood and Decoypond Wood, used by males on both occasions. Field surveys did not identify Bechstein's bats using Calvert Jubilee Nature Reserve (LWS), and survey results at Decoypond Wood were affected by intermittent or refused land access to these sites as discussed in Section 1.6.8.

2.4.277 Bechstein's bats are a very rare species in the UK<sup>30</sup> and are also classified as near threatened at the European level<sup>31</sup>. The roosts in this area are near the north-westerly edge of this species range in the UK. Consequently, maternity colonies and associated habitat that maintains these roosts are important to maintain the favourable conservation status of the UK population of Bechstein's bat.

### *Woodland bat roosts*

2.4.278 Three roosts of Daubenton's bat were recorded in Decoypond Wood, two of which were maternity colonies. There are further maternity roosts in Finemere Wood reported in CFA12. Roosts of brown long-eared bats were recorded in Decoypond Wood and nearby on the Aylesbury Link railway line, with numerous further roosts in Sheephause Wood and Finemere Wood in CFA12. Maternity colonies of Brandt's, Natterer's and whiskered bats were recorded in woodland in CFA12. In this area, trapping surveys recorded these three species near Decoypond Wood or at Calvert Jubilee LWS.

2.4.279 As discussed in sections 1.6.9 and 1.6.10 access in this area was intermittent, consequently data for Decoypond Wood and Sheephause Wood may represent the diversity and the numbers of the bat assemblage that is present.

### *Pipistrelle species*

2.4.280 A maternity colony of common pipistrelle was recorded along the Aylesbury Link railway to the north of Decoypond Wood, and a transitional roost of *Pipistrellus* sp. is present at Calvert Jubilee Nature Reserve LWS. High levels of activity were recorded for and the presence of a maternity colony is important for maintaining populations over wide areas.

### *Roosts associated with Chetwode*

2.4.281 Field surveys recorded several roosts in this area which included two brown long-eared maternity colonies (respectively between 20-30 individuals and 38 individuals), and a common pipistrelle maternity roost (70 individuals) at properties in Chetwode. A day roost for both brown long-eared (1-5 individuals) and Brandt's (one individual) bats was recorded near another property within Chetwode. An additional brown long-eared day roost was recorded near Sunflower Farm (estimated 1-5 individuals).

2.4.282 Four further roosts for common pipistrelle were recorded: day roosts south of Chetwode (one individual) and near the Hermitage (one to five individuals); a transitional roost near School End (three individuals); and a tree roost near Sunflower

<sup>30</sup> Bat Conservation Trust (2012). The state of the UK's bats: National Bat Monitoring Programme Population Trends 2012. BCT. London.

<sup>31</sup> Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status, introducing robust protection for those habitats and species of European importance.

Farm (one to five individuals). A day roost for soprano pipistrelle (one individual) was also present.

2.4.283 Although common and soprano pipistrelle, and brown long-eared bats are common and widespread in Buckinghamshire, maternity roosts are important for maintaining the conservation status of their populations. Although only one day roost was recorded, Brandt's bats are considered to be rare and their presence as part of the recorded assemblage is notable.

### ***Daubenton's roosts associated with Chetwode***

2.4.284 Two Daubenton's maternity roosts were identified in the Chetwode area from radio-tracking surveys within the Bernwood Forest. Daubenton's bats are considered to be common, but are associated with water bodies and their distribution is restricted to suitable habitat. Maternity roosts are important for maintaining the conservation status of their populations.

### ***Foraging Habitat***

2.4.285 The landscape comprises a range of habitats suitable for foraging and commuting bats. It is dominated by agricultural land including pasture linked by mature hedgerows, and with mature, semi-natural and ancient woodland. Scrub, woodland, lakes and mature hedgerows are also present, all of which are of value to foraging bats.

2.4.286 Of particular importance for foraging bats in this area are Calvert Jubilee Nature Reserve LWS and Decoypond Wood, and the Former Great Central Main Line disused railway. Foraging activity for all species was largely associated with the scrub, woodland and open water on the southern and eastern edges of the Calvert Jubilee Nature Reserve LWS.

### ***Bechstein's bat foraging***

2.4.287 Bechstein's bats were recorded, from radio-tracking studies, foraging in Sheephouse Wood and Decoypond Wood. Foraging behaviour for Bechstein's in the area to the south of Sheephouse Wood is reported in Waddesdon and Quainton (CFA12). Desk study data reinforces evidence that Bechstein's use Decoypond Wood and Sheephouse Wood to forage in; however, desk study records also indicate Bechstein's bat activity in Calvert Jubilee Nature Reserve (LWS).

2.4.288 Bechstein's bats are a specialist of woodland habitats<sup>32</sup>. Other small areas of habitat, such as watercourses, hedgerows, and treelines that provide connectivity between large woodland blocks are likely to be important in maintaining the conservation status of the population.

### ***Woodland bat foraging habitat***

2.4.289 Radio-tracking and static detector surveys indicate moderate levels of activity of Daubenton's bats and brown-long-eared bats foraging around two large open water habitats; Calvert Jubilee Nature Reserve (LWS) and Calvert Brick Pits LWS. Brown

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<sup>32</sup> Hill, D A, & Greenaway, F. (2006), *Putting Bechstein's bat on the map. Final Report to Mammals Trust UK*. London.

long-eared bats were also recorded foraging at Calvert Jubilee Nature Reserve LWS. Static detectors at Calvert Jubilee Nature Reserve and LWS also recorded moderate levels of *Myotis* activity which is likely to comprise Daubenton's bats, Brandt's, whiskered and Natterer's bats as they have all been recorded from field surveys and desk studies as using this area.

2.4.290 As discussed in section 1.6.13, brown long-eared bats were generally not recorded or recorded in very low numbers during the static detector surveys. However, there was a number of maternity roosts within the Bernwood Forest area and the low numbers of recorded brown long-eared calls is likely to be due to constraints in static detector methodology and the quiet call characteristics of the species. As such, their presence and subsequent abundance is likely to be underestimated.

#### *Eptesicus/Nyctalus foraging habitat*

2.4.291 Activity surveys recorded high levels of noctule bat activity in the scrub and woodland at the north-eastern edge of Calvert Jubilee Nature Reserve LWS. One Leisler's bat was radio-tagged on the Aylesbury Link railway line adjacent to the LWS and subsequently recorded foraging in that area.

2.4.292 Static monitoring data indicated low levels of activity of serotine bat at Calvert Jubilee Nature Reserve LWS. Transect surveys also recorded this species foraging adjacent to the Aylesbury Link railway line between Greatmoor Farm and Sheephause Wood in CFA12. The presence of *Nyctalus* and *Eptesicus* species as part of the wider assemblage of bats in this area is of note. High levels of noctule foraging activity were recorded in the north-eastern of Calvert Jubilee Nature Reserve LWS. In addition, static monitoring and transect surveys recorded occasional individual serotine and Leisler's bats.

#### *Pipistrelle species foraging habitat*

2.4.293 Radio-tracking studies identified moderate levels of common and soprano pipistrelle foraging along the Aylesbury Link railway line between Station Road, Quainton and Calvert Jubilee Nature Reserve LWS. This railway links several maternity roosts (discussed in CFA12) to the foraging habitat at Calvert Landfill Site and Calvert Jubilee Nature Reserve LWS. Static monitoring surveys recorded high levels of both pipistrelle species at the latter location. The presence of foraging habitat close to these maternity colonies is important in maintaining populations.

#### *Daubenton's foraging within Chetwode*

2.4.294 Radio-tracking surveys identified two Daubenton's bat roosts within Chetwode which were radio-tagged in the Bernwood Forest area and where they were subsequently identified as foraging. The same bats was also recorded foraging near the roost further north, around Chetwode. This species was also recorded foraging around the several water bodies and within the fragmented woodland present in this area. Daubenton's bats are considered to be common, but are associated with water bodies and their distribution is restricted to suitable habitat.

### *Nathusius' Pipistrelle foraging habitat*

2.4.295 Activity from Nathusius' pipistrelle was recorded in low levels at Calvert Jubilee Nature Reserve LWS indicative of occasional foraging. Nathusius' pipistrelle is a rare bat, and the levels of activity in this area are unlikely to occur frequently in Buckinghamshire.

### *Commuting Habitat*

2.4.296 The land between Edgcott Road, Quainton and Calvert Jubilee Nature Reserve LWS (which crosses both CFA12 and CFA13) is recorded as supporting large numbers of less common species with over 2000 desk study records for this section and a total of 86 roosts identified through radio-tracking. A further 33 roosts recorded during initial inspections were located in this area. The main commuting routes throughout this area are the Aylesbury Link railway and adjacent bridleway; the Former GCML disused railway; and adjoining mature hedgerows.

2.4.297 The routes used by Bechstein's for commuting between the three colonies identified are reported in CFA12. Radio-tracking evidence suggests that there is further commuting from Decoypond Wood to the other woodlands nearby. Bechstein's bats are known to commute from Grendon and Doddershall Woods to Sheephause Wood along the Edgcott Road and Aylesbury Link Railway.

2.4.298 The vegetation along the Aylesbury Link Railway, as well as adjoining hedges and scrub, provides commuting habitat for populations of common and soprano pipistrelle and Daubenton's bats. Moderate numbers of these species were recorded commuting along the Aylesbury Link Railway near Calvert Jubilee Nature Reserve LWS through activity and radio-tracking surveys. Radio-tracking data shows that these species use a range of features as commuting habitat as reported in Waddesdon and Quainton (CFA12). Common pipistrelles use the Aylesbury Link railway as a flightline from as far south as Buckinghamshire Railway Centre near Quainton in CFA12 through to Sheephause Wood. Soprano pipistrelles were radio-tracked commuting along the Aylesbury Link railway further south in CFA12, but are also likely to use the railway in this area, from Sheephause Wood through to Calvert Jubilee, as a flightline.

### *Bechstein's bat commuting habitat*

2.4.299 Bechstein's are a bat of woodland habitats that rely on hedgerows as commuting habitat. Therefore, other small areas of woodland and hedgerow, such as that linking Decoypond Wood and Sheephause Wood to the east of the Proposed Scheme, are important to maintaining conservation status of the population.

### *Woodland bat commuting habitat*

2.4.300 Data from radio-tracking surveys shows that Daubenton's bats use the Aylesbury Link railway and School Hill as flightline from Finemere Wood and Decoypond Wood to reach foraging sites at Calvert Jubilee Nature Reserve (LWS) and Calvert Brick Pits LWS. In CFA12, Brandt's, brown long-eared, Natterer's and whiskered bats were all shown to use parts of the Aylesbury Link railway line for commuting between roosts, foraging areas and other flightlines. They are also likely to use the Aylesbury Link railway line as a flightline in this area.

### *Eptesicus/Nyctalus commuting habitat*

2.4.301 The radio-tagged Leisler's bat was recorded commuting along the Aylesbury Link railway line adjacent to Calvert Jubilee Nature Reserve LWS and subsequently recorded commuting near Calvert Landfill site. Static monitoring data indicated low levels of activity of serotine bat indicating features at Calvert Jubilee Nature Reserve LWS were used for commuting.

### *Daubenton's commuting within Chetwode*

2.4.302 A Daubenton's bat Tagged in the Bernwood Forest area was subsequently tracked back to the roost in Chetwode during the radio-tracking surveys. Flightlines for this species were recorded along the Former GCML disused railway line that links to Calvert Jubilee LWS. Daubenton's bats are considered to be common, but are associated with water bodies and their distribution is restricted to suitable habitat.

### *Pipistrelle species commuting habitat*

2.4.303 Common and soprano pipistrelle have been shown to use much of the Aylesbury Link railway line between Station Road, Quainton in CFA12 and Calvert Jubilee Nature Reserve LWS, and it is likely that the railway line forms a continuous flight-line of this species.

## **CFA14 Newton Purcell to Brackley**

### *Overview of bat species status in the vicinity of CFA14*

2.4.304 Habitats suitable to support roosting, foraging and commuting bats in this area consists of arable, pasture, numerous intact hedgerows and several woodlands. All these habitats are present within and adjacent to the land required for the construction of the Proposed Scheme. The largest of the woodlands comprise Mixbury Plantation, Widmore Plantation and Diggings Wood. Wetland habitats include the River Great Ouse and its tributaries, and lowland fen at Turweston Manor Grassland LWS. Linear habitats associated with the three disused railways (the Former Great Central Main Line; the Banbury to Verney Junction Railway; and Helmdon Disused Railway Site of Special Scientific Interest (SSSI) near Radstone) are also present.

2.4.305 The presence of eight species of bat were confirmed in this area through field surveys and desk studies. These species include a scarce species; Leisler's bat, and two uncommon species, noctule, and serotine bats. Additionally, two very large maternity roosts of Natterer's bats were identified at Radstone. Natterer's bats are classified as species commonly found within the UK, however maternity roosts of this size are rare and are therefore of note.

2.4.306 Activity of bats in general was high in the Radstone area, with multiple roosts being identified and moderate to high levels of bat activity being recorded. Other areas of importance in this area were along the River Ouse Tributary to the south of Radstone, the Mixbury Plantation and habitats in the vicinity of the Former Great Central Main Line.

2.4.307 The eight bat species recorded in this area from field surveys and desk studies are as follows:

- Leisler's bat (*Nyctalus leisleri*);
- noctule bat (*Nyctalus noctula*);
- serotine (*Eptesicus serotinus*);
- Natterer's bat (*Myotis natterii*);
- Daubenton's bat (*Myotis daubentonii*)
- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*); and
- brown long-eared bat (*Pipistrellus pipistrellus*).

### *Roosting (Trees)*

2.4.308 A total of 242 trees were subject to an initial assessment in line with the methods described in the Field Survey Methods and Standards (FSMS) document. These surveys included ground based tree assessments and a subsequent climbed survey where required.

2.4.309 Of the 242 trees that were initially assessed, the following results were obtained;

- one confirmed bat roost was identified;
- 19 trees were assessed as having high potential to support roosting bats;
- 71 trees were assessed as having moderate potential to support roosting bats; and
- 151 trees were classified as having low or negligible potential to support roosting bats. These trees were therefore scoped out of further surveys.

2.4.310 Of the 91 trees assessed that had moderate or high potential to support roosting bats:

- 12 trees were subject to detailed climbing inspections; and
- Consequently three of these trees were reassessed as having low potential for roosting bats, and were scoped out of further surveys.

2.4.311 Eight of the 91 trees were subject to a total of 13 emergence surveys. No back tracking surveys were undertaken in this area. From the emergence surveys of these eight trees:

- the one common pipistrelle tree roost above was identified;
- The remaining 83 trees were not climbed as discussed in the constraints section 1.4.1 and 1.4.2.

2.4.312 Desk study records further confirmed the presence of a Daubenton's bat roost within 200m of the Proposed Scheme at Westbury and a noctule record 1.7km from the Proposed Scheme near Fin mere and Tingewick.

2.4.313 Details of confirmed tree roosts in this area of the route are provided in Table 70.

Table 70 Confirmed tree roosts within CFA14

Ecology survey code	Location	OS grid reference	Tree species	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
020-BT3-097-001	Radstone Cottage	SP 587 396	Pedunculate oak	Common pipistrelle (1)	1 May 2013 Emergence survey	Day	Overhanging limb with crevice	14	Within 50m of land required for the Proposed Scheme

### *Roosting (building and structures)*

2.4.314 A total of 14 buildings in this area were subject to external and internal inspections, resulting in the following:

- six buildings were identified as containing a total of nine bat roosts, which were confirmed through both internal inspections and emergence surveys;
- one building was assessed as having high potential to support roosting bats;
- two buildings were assessed as having moderate potential to support roosting bats; and
- five buildings were assessed as having low or negligible potential to support roosting bats and were therefore scoped out of further surveys.

2.4.315 Of the nine buildings assessed as having roosts or moderate or high potential to support roosting bats:

- all of the nine buildings were subject to a more detailed internal inspection, during which the six buildings containing roosts were confirmed;
- Consequently four of those nine buildings were subject to a total of 10 emergence surveys in this area. As discussed in constraints section 1.5.1 access for emergence surveys was not given to the five remaining buildings and access was not granted consistently across the season meaning some buildings did not have a complete set of emergence surveys.
- No buildings/structures were reassessed to low potential as a result from the internal building inspections or emergence surveys.

2.4.316 Details of confirmed roosts in buildings/structures in this area of the route are provided in Table 71.

Table 71 Confirmed bat roosts in buildings/structures in CFA14

Ecology survey code	Location	OS grid reference	Building/structure type	Species confirmed utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
020-BS3-098-001	Church of St Lawrence, Radstone	SP 589 406	Church	<i>Myotis</i> sp. (suspected Daubenton's bat established through sound analysis and foraging activity) (9 individuals seen emerging)	9 July 2013- emergence survey	Day	Church roof, gap in tiles near the sound-outlet-window	14	Within 50m of land required for the Proposed Scheme
020-BS3-098-001	Church of St Lawrence, Radstone	SP 589 406	Church	Common pipistrelle (19 individuals emerging)	9 July 2013 emergence survey	Maternity	Lifted tile in the clock tower roof on the south side.	14	Within 50m of land required for the Proposed Scheme
020-BS3-098-001	Church of St Lawrence, Radstone	SP 589 406	Church	Natterer's bat (est. 185-250 individuals)	10 July 2013 internal inspection and emergence survey	Maternity	Large maternity roost occupying the central church structure- evidence of high levels of use are present- 14 bats were seen roosting between the hip and apex joist during inspection. 16 dead bats found behind the pulpit indicating the roost utilises large part of the main structure of the church.	14	Within 50m of land required for the Proposed Scheme
020-BS3-098-001	Church of St Lawrence, Radstone	SP 589 406	Church	Brown long-eared bat (est. 28 individuals)	10 July 2013 emergence survey	Maternity	Emergence from a gap under the roof batons.	14	Within 50m of land required for the Proposed Scheme
020-BA6-097-001	Property adjacent to Radstone Church	SP 589 406	Residential	Natterer's bat (est. 40-80 individuals)	10 July 2013 emergence survey	Maternity	Possible maternity roost: around St Laurence's church identified a large number of Natterer's bats exiting and returning at this house near the church.	14	Within 80m of land required for the Proposed Scheme
020-BS2-	Properties at	SP 586	Residential	Pipistrelle species (est. 15-20 individuals from 200)	31 January 2013 Internal	Maternity	Roof apex between four adjoining roof voids	14	Within 50m of land required for

Appendix EC-003-002

<b>Ecology survey code</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Building/structure type</b>	<b>Species confirmed utilising roost and (peak count)</b>	<b>Date of peak count and nature of survey</b>	<b>Roost type</b>	<b>Roost description</b>	<b>CFA</b>	<b>Approximate distance from the Proposed Scheme</b>
097-004	Radstone	406		bat droppings).	inspection				the Proposed Scheme
020-BA6-097-001	Properties at Radstone	SP 587 399	Residential	Brown long-eared bat - (est. 20-30 individuals)	4 June 2013 Emergence survey	Maternity	Roof apex and between the rafters and chimney brick walls and between the tiles and felt within the roof void	14	Within 50m of land required for the Proposed Scheme
020-BS2-090-001	Warren Farm	SP624 332	Residential	Brown long-eared bat - (est. 1-5 individuals from 60 bat droppings)	4 February 13 Internal inspection	Day	Roof apex at the roof entrance behind a king truss	14	Within 50m of land required for the Proposed Scheme
020-BS2-087-001	The Hermes	SP 628 311	Residential	Brown long-eared bat (5-10 individuals)	19 March 2013 Internal inspection and emergence survey	Maternity	Small roof void on a bungalow located along under the ridge beam	14	Within 50m of land required for the Proposed Scheme

### *Bat activity surveys*

2.4.317 This area can broadly be divided in to a northern section at Radstone and a southern section around Fin mere Quarry and the Mixbury Plantation area.

2.4.318 Bat activity was moderate to high in the Radstone area, where eight bat roosts were identified from both tree and building surveys.

2.4.319 The methodology of bat activity surveys and static detector surveys undertaken at Radstone was adapted in order to better understand how the bats from the two large maternity roosts of Natterer's, as well as other roosts in north of this area used the landscape for foraging and commuting.

2.4.320 In the southern section of the route, bat activity was lower compared with that recorded in the northern section of the route. This is likely to reflect the fewer bat roosts that were identified in the south and access restrictions which limited surveys.

Table 72 Bat activity surveys conducted within CFA14

Ecology survey code	Transect location	Number of surveys conducted	First survey date	Final survey date	CFA	Map Reference
020-BA1-087001	Mixbury and Radstone	4	30 April 2013	30 April 2013	14	SP 536 246
020-BA2-089001	Fin mere Quarry	3	30 May 2013	12 July 2013	14	SP 609 344
020-BA2-090001	Warren Farm	2	30 April 2013	8 May 2013	14	SP 585 246
020-BA2-097001	Radstone, Brackley	4	1 May 2013	1 August 2013	14	SP 618 338

Table 73 Bat activity transect survey results - Transect 020-BA1-087, 090, 091 and 097, Mixbury and Radstone

Ecology survey code	Transect location				Description of habitats covered by transect																	
CFA14	Mixbury and Radstone				Arable field margins and a footpath through woodland with hedges on both sides.																	
Visit number and date	Weather conditions				Total species passes during transect survey																	
	Temp (°C)	Cloud (0-8) <sup>33</sup>	Rain (0-5) <sup>34</sup>	Wind (0-12) <sup>35</sup>	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Es	
Visit 1: Dusk 30 April 2013. 020-BA1-087-001	9-6	1	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visit 2: Dusk 04 June 2013 020-BA1-091-001	13	1-7	0	2	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visit 3: Dawn 05 June 2013 020-BA1-091001	10-11.5	6-8	0	2	8	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visit 4: Dusk 03 July 2013 020-BA1-097001	17-13	0-2	0	0-2	101	16	0	0	0	0	1	0	0	0	11	0	0	0	1	0	0	0
Visit 5: Dawn 04 July 2013 020-BA1-091001	15	0	0 (briefly 1)	0	40	2	0	0	0	0	0	0	0	0	4	3	0	16	0	11	0	0

2.4.321 Moderate numbers of common pipistrelles were recorded at this location during every site visit with a peak count of 101 passes recorded in July. Soprano pipistrelle and *Myotis* species were recorded sporadically and in low numbers with peak counts of 16 and 11 passes, respectively. Brown long-eared bat activity was limited with a total of three passes recorded in July around the Mixbury area indicating that habitat here is used as commuting routes by this species.

<sup>33</sup> Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

<sup>34</sup> Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

<sup>35</sup> Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

Table 74: Summary of static detector monitoring results for 020-BA2-089001, Fin mere Quarry

Ecology survey code	Location	OS Grid		Description of habitat															
020-BA2-089001	Fin mere Quarry	SP 625 324		Open habitat mosaic on disturbed ground comprising dense scrub, ephemeral and ruderal vegetation															
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																	
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Ep	
30 May 2013	1	5	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
28 June 2013 - 30 June 2013	3	4	1	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6	
1 July 2013- 12 July 2013	9	16	26	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	

2.4.322 Overall, at Finmeree Quarry, low levels of activity was recorded for common and soprano pipistrelles, with peak counts of 26 and 16ppn respectively recorded in July. Less frequent activity of *Myotis* sp., noctule and serotine bats was recorded here.

Table 75: Summary of static detector monitoring results for 020-BA2-090001, Warren Farm

Ecology survey code	Location	OS Grid		Description of habitat															
020-BA2-090001	Warren Farm	SP 620 334		Arable and Improved/poor semi-improved grassland															
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																	
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Ep	
30 April 2013- 01 May 2013	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
01 May 2013 - 8 May 2013	9	237	15	0	1	0	0	0	0	0	0	42	0	0	0	0	0	0	

2.4.323 Almost no bat activity was recorded in April but moderate numbers of common pipistrelle (peak count of 37ppn) and *Myotis* sp. (peak count of 42ppn) were recorded in early May, together with low numbers of soprano pipistrelle passes (peak count of 15ppn).

Table 76: Summary of static detector monitoring results for 020-BA2-097001- MM data, Radstone,

Ecology survey code	Location	OS Grid	Description of habitat																	
020-BA2-097001	Radstone, situated along a disused vegetated railway corridor. The sides of the corridor is a mix of native deciduous tree species in the south of Helmdon Disused Railway SSSI	SP 591 400	Unimproved calcareous grassland in a disused rail cutting with dense bank scrub surrounded by arable bordered with hedgerows																	
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																		
Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Ep				
1 May 2013 - 08 May 2013 and 29 May 2013 and 31 May 2013	11	1047	3	0	0	0	1	0	0	14	0	0	0	0	0	0	1			
1 June 2013 - 7 June 2013 and 14 June 2013- 23 June 2013 and 28 June 2013 - 29 June 2013	19	299	0	0	0	0	0	0	0	12	0	0	0	1	0	0	0			
23 July 2013 - 31 July 2013	8	255	3	0	3	0	0	0	0	7	0	0	0	0	0	0	3			
01 August 2013	1	42	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0			

2.4.324 A static monitoring device was located to the south of the disused railway. Levels of activity were comparatively high between the Radstone static detectors with a higher species richness of bats (up to eight species) compared to bat assemblages at other locations within this area. Common pipistrelles were present in high numbers with a peak count in May of 1047ppn. The number of passes decreased to 299ppn and 255ppn in June and July. Low levels of activity were recorded from *Nyctalus* and *Eptesicus* species. *Myotis* activity was moderate in this area with a peak of 14ppn which was comparatively lower than the activity in the north of the disused railway which saw a peak of 52ppn.

Table 77 Summary of static detector monitoring results for 020-BA2-097002, Radstone

Ecology survey code	Location		OS Grid	Description of habitat																
020-BA2-097002	Radstone, situated to the north-east of Radstone church along the north Helmdon Disused Railway SSSI		SP 591 407	Unimproved calcareous grassland in a disused rail cutting with dense bank scrub surrounded by arable bordered with hedgerows																
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																		
24 July 2013 -31 July 2013	7	352	9	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Ep
31 July -6 August 2013	7	285	12											52			5	12		
														19			3	9		

2.4.325 A static monitoring device was located to the north of the Helmdon Disused Railway SSSI. Higher levels of activity were recorded in general for *Myotis* species, noctules, serotines and soprano pipistrelles in this location compared to the static device in the south of Helmdon Disused Railway SSSI. This indicates that bats are commuting from their roosts, to the west of Helmdon Disused Railway SSSI, north-eastwards to suitable foraging habitat in the form of a woodland. Common pipistrelle activity was high, but similar to that recorded south of the Helmdon Disused Railway SSSI.

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Table 78 Summary of static detector monitoring results for 020-BA2-097003, Radstone

Ecology survey code		Location		OS Grid		Description of habitat														
020-BA2-097003		Radstone, situated directly to the north of the watercourse which runs south of Church of St. Lawrence, Radstone and bisects the Helmdon Disused Railway SSSI.		SP 591 403		Unimproved calcareous grassland, the tree and scrub lined tributary of the River Ouse, the surrounding landscape arable bordered by hedgerows														
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring																	
30 May 2013 - 4 June 2013			Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Ep	
27 June 2013 - 4 Jul 2013		6	320	38									35			11		7		
		7	277	14									18			2		1		

2.4.326 Similar numbers of pipistrelles, *Myotis*, noctules and serotines were recorded at this location when compared to those recorded to the north and south, with a peak count of 320 common pipistrelle passes in May and June. Slightly elevated numbers of *Myotis* species were recorded at this location with a peak of 35ppn recorded in May and June. Relatively high levels of the large bats were recorded at this location with peak counts of 11ppn noctule and seven ppn serotine.

Table 79 Summary of static detector monitoring results for 020-BA2-097-004, Radstone

Ecology survey code		Location		OS Grid		Description of habitat														
020-BA2-097004		Radstone, situated in the middle of Radstone estate located to the west of the estate and west of the Natterer's roost. The SM2 was situated in a small cluster of mature trees on the perimeter of a field.		SP 587 404		Arable and Improved/poor semi-improved grassland with bordered hedgerows.														
Date (night monitoring commenced to night monitoring ceased)		Number of nights detector deployed	Species peak night count during monthly monitoring																	
9 July 2013-16 July 2013			68	3										27			1			

<b>Ecology survey code</b>	<b>Location</b>	<b>OS Grid</b>		<b>Description of habitat</b>												
020-BA2-097004	Radstone, situated in the middle of Radstone estate located to the west of the estate and west of the Natterer's roost. The SM2 was situated in a small cluster of mature trees on the perimeter of a field.	SP 587 404		Arable and Improved/poor semi-improved grassland with bordered hedgerows.												
<b>Date (night monitoring)</b>	<b>Number of nights detector deployed</b>	<b>Species peak night count during monthly monitoring</b>														
24 July 2013 - 31 July 2013	7	387	9										21		2	1
31 July 2013 - 6 August 2013	7	272	17										19		4	1
7 August 2013 - 13 August 2013	6	305	12										15		4	2

2.4.327 Common pipistrelle activity was constant across Radstone Manor with numbers of passes indicating moderate to high levels of activity. The species assemblages were similar across all three static recording locations with high numbers of common pipistrelles, moderate numbers of *Myotis* species and low-moderate ppn of noctules and serotines. At this location peak counts of common pipistrelles 387ppn, soprano pipistrelle 17ppn, *Myotis* species 27ppn, noctules four ppn and serotine two ppn were recorded. Similar numbers to these were recorded to the west of the estate and along Helmdon Disused Railway SSSI indicating constant levels of activity for common and less common species across the Radstone area.



## Discussion

### *Bat Assemblage*

2.4.328 Field survey records confirmed the presence of eight species of bat within this area. These comprised five common species, namely common and soprano pipistrelles, brown long-eared bats, Natterer's and Daubenton's bats, and two less common and a scarce species, namely; the bat and two rarer species; serotine and noctule and Leisler's bats, respectively.

2.4.329 Desk studies provided evidence of whiskered bats foraging this area and there is a record of a serotine roost within 1km of the land required for the construction of the Proposed Scheme to the north of Newton Purcell.

### *Roosts*

2.4.330 A total of nine roosts were located in six buildings within this area. Four of these roosts were located within the Church of St Lawrence, Radstone within the Radstone Manor area. The most notable is a maternity roost of Natterer's bats, comprising up to 250 individual bats. The three further roosts identified within the Church of St Lawrence were a common pipistrelle roost of approximately 20 individuals, a Daubenton's bat roost of approximately 10 individuals and a brown long-eared bat roost of approximately 25 individuals. Bats from these four roosts were recorded emerging from the church at different exits. This location is therefore of particular importance within this area. The four roosts in the Church of St Lawrence, Radstone may be indirectly affected by the Proposed Scheme as it is located within 25m of the land required for construction of the Proposed Scheme.

2.4.331 A residential property in close proximity (approximately 40m) to the Church of St Lawrence, Radstone was identified as having another Natterer's roost of significant size. This roost of between 40-80 individuals is likely to be a satellite maternity roost to the main maternity roost within the church. This site is within 80m of the land required for the construction of the Proposed Scheme.

2.4.332 Two further residential properties within the Radstone Manor area were identified as having one common pipistrelle maternity roost and one brown long-eared bat maternity roost. Both roosts were recorded in separate buildings, situated in close proximity to one another and located within 50m of the land required for the construction of the Proposed Scheme. In addition, two buildings located in the more southerly sections of Radstone were identified as each having a brown long-eared bat roost. These roosts supported approximately 5-10 and 5-15 individual bats respectively and are located within 20m of the land required for the construction of the Proposed Scheme. Two properties near Fin mere and Newton Purcell were found to support one brown long-eared bat day roost and one brown long-eared bat maternity roost. These roosts supported approximately 5-15 individuals, and 10-20 individuals respectively and are located within 50m of the land required for the construction of the Proposed Scheme. The roost type at Fin mere was estimated from the number and age of droppings, however emergence surveys were not possible for reasons discussed in sections 1.5.1 and therefore could not confirm a maternity roost.

2.4.333 One tree roost was identified from field surveys with a suspected common pipistrelle day roost in an established tree within Radstone located within 50m of the land required of the construction of the Proposed Scheme.

2.4.334 Emergence and activity surveys at Radstone were undertaken in a short period of time towards the end of the 2013 survey season. Late and intermittent access, as discussed in section 1.5.1 and 1.5.2, resulted in sub-optimal timing of surveys which may under-represent the bat assemblage present and bat activity levels.

### *Foraging Habitat*

2.4.335 The landscape in this area comprises farmland with small areas of woodland, watercourses and established hedgerows. Watercourses that provide foraging habitat for bats include the River Ouse and its tributaries. Important bat populations of rarer species (including serotine, noctule and some *Myotis* species) are known to be present in this area established from field surveys and are likely to use these areas for foraging.

2.4.336 Field survey data indicates high bat activity within the Radstone area, with a total of seven roosts and several key foraging areas identified. Bat activity levels were broadly similar across the recording locations; however, foraging was marginally more prominent to the west. Key foraging routes observed here were, along the arable fields and well-connected hedgerows; to the north east of the Church of St Lawrence, Radstone over Helmdon Disused Railway SSSI; and east along the River Ouse tributary.

2.4.337 Fin mere Quarry and Warren Farm had low levels of foraging activity, with low-moderate activity on the GCML disused railway near Mixbury.

### *Commuting Habitat*

2.4.338 The hedgerow network in this area is long established and has good connectivity to other suitable bat habitat. Along with the watercourses cited above, it provides an extensive network of habitat features suitable for commuting bats. In particular there are a number of disused railways in this area that partially fall within the land required for the Proposed Scheme. Activity levels recorded by the static detectors located at Radstone were of similar levels, with higher numbers of each species recorded in the north and central locations, indicating this area is important for commuting to the network of woodland and connecting scrub.

2.4.339 Field surveys indicate bats use Helmdon Disused Railway SSSI intensively as a commuting route, linking the roost sites located at Radstone with woodland in the north east and connecting with the River Ouse and its tributaries.

2.4.340 Other commuting routes of note within the area include the GCML near Westbury and Banbury to Verney Junction Branch Line disused railways and the connected habitats around the Mixbury plantations. Moderate activity by common pipistrelles and *Myotis* species was recorded in these areas. Two known brown long-eared bat roosts are located in land adjacent to the disused railways at Newton Purcell and near Fin mere, and bats roosting here would likely use these habitats for commuting.

2.4.341 Desk study data further indicates Daubenton's commuting and foraging around the Westbury area where surveys were not undertaken. Parts of Westbury falls within 200m of the Proposed Scheme. Desk studies also refer to the presence of noctules commuting around the Fin mere and Tingewick area which falls within 1.5km of the Proposed Scheme.

## CFA15 Greatworth to Lower Boddington

### *Overview of bat species status in the vicinity of CFA15*

2.4.342 Areas within and adjacent to the land required for the construction of the Proposed Scheme predominantly comprise farmland with pasture and numerous hedgerows, which provide suitable commuting and foraging habitat for bats. There are two disused railways, one at Lower Thorpe and one at Lower Aston Le Walls, which provide suitable commuting and foraging habitat for bats. Areas of woodland are present at Halse Copse South near Halse, Lower Thorpe and Glyn Davies Wood near Lower Boddington, which also provide suitable roosting and foraging habitat. The residential areas of Radstone, Greatworth, Thorpe Mandeville, Chipping Warden and Lower Boddington also provide potential roosting sites. This region also features the River Cherwell and tributaries, the Highfurlong Brook, Trafford Bridge Marsh, and a number of ponds at Lower Thorpe and Aston-le-Walls.

2.4.343 The bat assemblage in this area comprises at least 10 species identified from field surveys and desk study data. These include two rare bats; Natusius' pipistrelle and Brandt's bat; one uncommon species, Leisler's bat; and two less common species, noctule and serotine bats.

2.4.344 The following bat species have been recorded during the range of field surveys and desk studies conducted in this area;

- Whiskered bat (*Myotis mystacinus*);
- Natusius' pipistrelle (*Pipistrella nathusii*);
- Brandt's bat (*Myotis brandtii*);
- Leisler's bat (*Nyctalus leisleri*);
- serotine (*Eptesicus serotinus*);
- noctule bat (*Nyctalus noctula*);
- Natterer's bat (*Myotis natterii*);
- brown long-eared bat (*Plecotus auritus*);
- common pipistrelle (*Pipistrellus pipistrellus*); and
- soprano pipistrelle (*Pipistrellus pygmaeus*).

### *Roosting (Trees)*

2.4.345 Overall, 157 trees were subject to an initial assessment in line with the methods described in the Field Survey Methods and Standards (FSMS) document. These

included ground based survey and a subsequent climbed inspection where appropriate.

2.4.346 The initial assessment found the following:

- two confirmed tree roosts were identified within two trees at one site;
- 11 trees were assessed as having high potential to support roosting bats;
- 65 trees were assessed as having moderate potential to support roosting bats; and

2.4.347 79 trees were assessed as having low or negligible potential to support roosting bats; these trees were therefore scoped out of further survey.

2.4.348 Of the 78 trees assessed that are confirmed roosts or have moderate or high potential to support roosting bats:

- 42 trees were not subject to a climbed inspection for reasons discussed in section 1.4.1.
- 36 trees were subject to further surveys in the form of a climbed tree inspection, and, as a result:
- 11 trees were re-assessed as having low or negligible potential to support roosting bats and were scoped out of further survey.

2.4.349 Of these remaining 25 trees, 21 trees were subject to emergence surveys. No back tracking surveys were undertaken in this area. From the emergence surveys of these 21 trees:

- the two tree roosts noted in 1.3.5 above were identified;
- The remaining 4 trees were not climbed owing to restricted access.

2.4.350 Details of confirmed tree roosts in this area of the route are provided in Table 11.

Table 80: Confirmed tree roosts within CFA15 Greatworth to Lower Boddington

Ecology survey code	Location	OS grid reference	Tree species	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
020-BT3-116-001	Fox Covert (Glyn Davis Wood) tree 6	SP 462 535	Pedunculate oak	Noctules (8)	16 August 2012 emergence survey	Maternity	Bat box located on a well-established oak tree	15	Within land required for the Proposed Scheme
020-BT3-	Fox Covert	SP 462 535	Pedunculate	Common pipistrelle	22nd August	Summer	Bat box located	15	Within land required for

Ecology survey code	Location	OS grid reference	Tree species	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
116-002	(Glyn Davis Wood) tree 11		oak	s (2)	2012 emergence survey		on a well-established oak tree		the Proposed Scheme

### *Roosting (building and structures)*

2.4.351 A total of 36 buildings were subject to external and internal inspections, resulting in the following:

- six buildings were confirmed to support nine bat roosts in, with three in one building, two in another and one in each of four further buildings;
- one building had features assessed as having high potential to support roosting bats;
- 13 buildings/structures had features assessed as having moderate potential to support roosting bats; and
- the remaining 3 buildings were assessed as having low or negligible potential to support roosting bats, these were therefore scoped out of further survey.

2.4.352 Of the 20 buildings with roosts or assessed as having high or moderate potential to support roosting bats:

- 13 were subject to a more detailed internal inspection. This resulted in the six buildings noted in 1.3.5 above being confirmed as supporting roosts; and
- of these 13 buildings, one building was reassessed from having high to having moderate potential to support roosting bats.
- Consequently, of the 20 buildings, fifteen were subject to a total of 27 emergence surveys within this area;
- the remaining eight buildings were not subject to emergence surveys due to access issues and cancellation of surveys as discussed in sections 1.5.1 and 1.5.2.

2.4.353 No backtracking surveys were undertaken within this area.

2.4.354 Details of confirmed roosts in buildings/structures in this area of the route are provided in Table 81.

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Table 81: Confirmed bat roosts in buildings/structures in CFA15 Greatworth to Lower Boddington

Ecology survey code	Location	OS grid reference	Building/structure type	Species confirmed utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Distance from the Proposed Scheme
020-BS2-105002	Culworth Grounds Farm	SP 536 459	Barn	Common pipistrelle (1)	16.05.13 - emergence survey	Transitional	L-shaped single-storey brick built barn with a pitched slate tiled roof.	15	Within 25m of land required for the Proposed Scheme
020-BS2-105-005	Culworth Grounds Farm	SP 536 459	Barn	Brown long-eared bat (low numbers of droppings)	30/01/13, Internal Inspection	Transitional	Two-storey stone barn with a pitched slate tile roof. Structure split into four internal spaces.	15	Within 25m of land required for the Proposed Scheme
020-BS2-105-005	Culworth Grounds Farm	SP 536 459	Barn	Low numbers of Natterer's droppings (1-5)/peak count of 1 individual	30/05/13, emergence survey	Transitional	Two-storey stone barn with a pitched slate tile roof. Structure split into four internal spaces	15	Within 25m of land required for the Proposed Scheme
020-BS3-105-001	Buildings at Lower Thorpe	SP 534 453	Residential	Brown long-eared bat	26 February 2013, Internal Inspection	Maternity (Small)	1800's semi-detached house of brick with slate roof and dormers windows	15	Within 20m of land required for the Proposed Scheme
020-BS3-105-001	Buildings at Lower Thorpe	SP 534 454	Residential	Pipistrelle species (21 bats)	15 June 2013, emergence survey	Maternity	Two-storey house constructed from stone & brick with a clay tiled roof.	15	Within 25m of land required for the Proposed Scheme
020-BS2-105-001	Building south of Lower Thorpe	SP 534 454	Residential	Brown long-eared bat (10-20 droppings)	01/02/2013, Internal Inspection	Day	Two-storey house constructed from stone & brick with a clay tiled roof.	15	Within 25m of land required for the Proposed Scheme
020-BS2-102-004	Land and buildings at Greatworth	SP 561 441	Residential	Brown long-eared bat (droppings)	27/02/2013, Internal Inspection	Maternity	Void 1: One pile of bat droppings found at each end of the roof.	15	Within 750m of land required for the Proposed Scheme
020-BS2-102-004	Land and buildings at Greatworth	SP 561 441	Residential	Brandt's bat (droppings)	27/02/2013, Internal Inspection	Day	The roost was found in a stone building approximately 200-300 years old. Void 2: bat droppings found.	15	Within 750m of land required for the Proposed Scheme

<b>Ecology survey code</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Building/structure type</b>	<b>Species confirmed utilising roost and (peak count)</b>	<b>Date of peak count and nature of survey</b>	<b>Roost type</b>	<b>Roost description</b>	<b>CFA</b>	<b>Distance from the Proposed Scheme</b>
020-BS2-102-002	Greatworth Park, south of the B4525	SP 553 435	Warehouse	Brown long-eared bat (droppings )	26/02/2013, Internal Inspection	Maternity	Factory and offices with 3 main roof voids.	15	Within 750m of land required for the Proposed Scheme

### *Bat activity surveys*

2.4.355 The following bat species have been recorded during the range of bat activity surveys conducted in this area:

- common pipistrelle;
- soprano pipistrelle;
- Natusius' pipistrelle;
- brown long-eared bat;
- Natterer's bat;
- Leisler's bat;
- serotine; and
- noctule bat.

Table 82: Bat activity surveys conducted within CFA15 Greatworth to Lower Boddington

Ecology survey code	Transect location	Number of surveys conducted	First survey date	Final survey date	CFA	Map Reference
020-BA1-099001	Halse Copse	1	1 May 2013	1 May 2013	15	SP 583 419
020-BA1-099002	Halse Copse	2	6 June 2013	7 June 2013	15	SP 577 414
020-BA1-099003	Halse Copse	1	2 July 2013	2 July 2013	15	SP 583 419
020-BA1-101001	Greatworth	5	6 June 2013	10 July 2013	15	SP 583 419
020-BA1-105001	Banbury Lane	5	6 June 2013	10 July 2013	15	SP 527 443
020-BA2-099001	Halse Copse	4	29 May 2013	22 July 2013	15	SP 583 419
020-BA2-099002	Northeast of Halse Copse	1	2 May 2013	10 May 2013	15	SP 577 414
020-BA2-105001	Culworth Grounds Farm	4	31 May 2013	21 July 2013	15	SP 532 459
020-BA2-105002	Bulls Lane, Thorpe Mandeville	1	30 April 2013	6 May 2013	15	SP 538 453

Table 83: Bat activity transect survey results - Transect o20-BA1-099001; o20-BA1-099002; o20-BA1-099003; o20-BA1-101001; o20-BA1-105001, Hale Copse

<b>Ecology survey code</b>	<b>Transect location</b>				<b>Description of habitats covered by transect</b>																		
o20-BA1-099001; o20-BA1-099002; o20-BA1-099003; o20-BA1-101001; o20-BA1-105001	Halse Copse, Greatworth, Banbury Lane				Arable field margins, bordered by hedgerows and rough grassland with adjacent woodland.																		
<b>Visit number and date</b>	<b>Weather conditions</b>				<b>Total species passes during transect survey</b>																		
	<b>Temp (°C)</b>	<b>Cloud (0-8)<sup>36</sup></b>	<b>Rain (0-5)<sup>37</sup></b>	<b>Wind (0-12)<sup>38</sup></b>	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Es		
Visit 1: Dusk 01 May 2013	11-8	1	0	0	3	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Visit 2: Dusk 06 June 2013	11	0	0	1-2	9	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Visit 3: Dawn 07 June 2013	8-10	0	0	0	3	3	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visit 4: Dusk only 02 July	15-12	8	0 (4 after end)	4	8	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1
Visit 5: Dusk 09 July 2013	18	1	0	0	3	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	2	
Visit 6: Dawn 10 July 2013	9.6	1	0	0	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total*</b>					34	7	0	5	0	0	0	0	0	0	7	1	0	1	0	0	0	3	

## KEY

[1] SPECIES: Pp - Common pipistrelle, P py - Soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - Whiskered bat, Mbr - Brandt's bat, Mm/Mb -Whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -Brown long-eared bat, Bb - Barbastelle bat, Nn - Noctule bat, NI - Leisler's bat, Es - Serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

[2] Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

<sup>36</sup> Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

<sup>37</sup> Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

<sup>38</sup> Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

<b>Ecology survey code</b>	<b>Transect location</b>	<b>Description of habitats covered by transect</b>																			
020-BA1-099001; 020-BA1-099002; 020-BA1-099003; 020-BA1-101001; 020-BA1-105001	Halse Copse, Greatworth, Banbury Lane	Arable field margins, bordered by hedgerows and rough grassland with adjacent woodland.																			
<b>Visit number and date</b>	<b>Weather conditions</b>	<b>Total species passes during transect survey</b>																			
	Temp (°C)	Cloud (0-8) <sup>36</sup>	Rain (0-5) <sup>37</sup>	Wind (0-12) <sup>38</sup>	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/Es

[3] Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

[4] Wind speed score of 0-12 against Beaufort scale where 0 = Calm, 2 = Light breeze, 4 = Moderate breeze, 6 = Strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

\* Total is not adjusted for effort in different sections of transect

2.4.356 Low levels of activity for common pipistrelle were observed on every survey visit with a peak record of nine passes per night in June 2013. Soprano pipistrelle were also recorded in low numbers and were only seen on four of the six visits. On the dawn visit in June 2013, a single *Nathusius'* pipistrelle was recorded. Records for unidentified pipistrelle species were also noted during the two visits in June 2013. *Myotis* species bat were recorded on three different dusk surveys during May and July 2013. A brown long-eared bat and a noctule bat were each encountered on a single occasion in June and July 2013, respectively. Unidentified *Nyctalus/Eptesicus* bat passes were recorded on both dusk visits during July 2013.

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Table 84 Summary of static detector monitoring results for 020-BA2-099001 Greatworth to Lower Boddington

Ecology survey code	Location	OS Grid		Description of habitat															
020-BA2-099001	Halse Copse	SP 577 414		Located on an oak tree along southern (toward SE) at edge of woodland with mature trees at north side and arable and grass fields at the south															
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																	
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Ep	
Date (night monitoring commenced to night monitoring ceased)	Peak count in one night over month (June)	578	949	0	3	0	0	0	0	0	0	4	0	0	1	1	2	2	
	Peak count in one night over month (July)	0	0	0	499	0	0	0	0	0	0	19	0	0	0	0	0	3	
	Number of nights detector deployed e.g. 7																		
29 May 2013 – 31 May 2013	3	401	125	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	
1 June 2013 – 7 June 2013 and 14 June 2013– 23 June 2013	15	3187	2306	0	4	0	0	0	0	0	0	23	0	0	1	2	3	2	
12 June 2013– 22 July 2013	11	0	0	0	2929	0	0	0	0	0	0	51	0	0	0	0	0	9	

[1] Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp. - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

2.4.357 High levels of activity were recorded for both common and soprano pipistrelles during May and June 2013. Peaks of activity for both species were observed during June 2013 with passes per night (ppn) peaking at 2306 for soprano pipistrelle. Pipistrelle bat records for July 2013 were only analysed to genus level with peak counts of 2,929ppn. Although the species' were undetermined, the high number of passes recorded suggests similar activity levels to the previous two months. *Myotis* species were recorded during all months in low

numbers with a peak of activity in July 2013 of 51ppn. A peak count of one ppn for a noctule and two ppn for a Leisler's bat was recorded during June 2013, whilst serotine bats were recorded in May and June 2013 with a peak count of three ppn. *Nyctalus/Eptesicus* bat passes were recorded in low numbers during June and July 2013 with a peak of 9ppn.

Table 85 Summary of static detector monitoring results for o20-BA2-099002 Lower Greatworth to Lower Boddington

Ecology survey code	Location	OS Grid		Description of habitat																														
o20-BA2-099002	NE of Halse Copse- hedgerow opposite reed bed to the north of the public footpath. Within hedgerow of field boundary.	SP 583 419		Arable with bordered hedgerow and in proximity to disused railway with dense scrub and calcareous grassland																														
Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																Pp	Ppy	Pn	P	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M	Pa	Bb	Nn	Nl	Es	Ny/Ep
		sp.																sp.	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Date (night monitoring commenced to night monitoring ceased)	Peak count in one night over month (May)	43	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Number of nights detector deployed																																	
2nd – 10th May 2013	8	67	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
[1] Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - <i>Myotis</i> bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - <i>Nyctalus/Eptesicus</i> bat.																																		

2.4.358 Common pipistrelles were recorded in low to moderate numbers during May 2013 with a peak count of 67ppn. Both soprano pipistrelle and *Myotis* species activity was limited to a peak count of two passes during this same period.

Table 86 Summary of static detector monitoring results for 020-BA2-105001

<b>Ecology survey code</b>	<b>Location</b>	<b>OS Grid</b>		<b>Description of habitat</b>														
020-BA2-105001	Culworth Grounds Farm Estate, Lower Thorpe Disused Railway -	SP 532 459		Unimproved calcareous grassland in a disused rail cutting with dense bank scrub surrounding landscape it arable bordered by hedgerows														
<b>Date (night monitoring commenced to night monitoring ceased)</b>	<b>Number of nights detector deployed</b>	<b>Species peak night count during monthly monitoring</b>																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/Mb	M sp.	Pa	Bb	Nn	NI	Es	Ny/Ep
Peak count in one night over month (June)	1	642	3	0	191	0	0	0	0	0	0	44	0	0	0	0	0	1
Peak count in one night over month (July)	1	577	0	0	252	0	0	0	0	0	0	16	0	0	0	0	0	1
31st May 2013	1	339	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
1st – 9th, 14th – 23rd and 28th – 30th June 2013	20	3441	7	0	382	0	0	0	0	0	0	146	0	0	0	0	0	1
1st – 7th July 2013	6	1967	0	0	14	0	0	0	0	0	0	22	0	0	0	0	0	0
12th – 21st July 2013	10	0	0	0	1597	0	0	0	0	0	0	1	0	0	0	0	0	1

[1] Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, NI - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

2.4.359 High levels of common pipistrelle activity was recorded during all months with activity peaking (3,441ppn) during June 2013. Soprano pipistrelle activity was noted at low levels only (7ppn) during June 2013. Pipistrelle bat records for the latter session of static monitoring during July 2013 were only analysed to genus level, for which high levels of activity (1,597ppn) were recorded. *Myotis* species were recorded in moderate numbers (146ppn) during June 2013, whilst activity was lower during July 2013 (22ppn) and limited to a single pass in May 2013. *Nyctalus*/ *Eptesicus* bat activity consisted of a single pass in both June and July 2013.

Table 87 Summary of static detector monitoring results for 020-BA2-105002 Greatworth to Lower Boddington

Ecology survey code	Location	OS Grid	Description of habitat																
020-BA2-105002	Bulls Lane, Thorpe Mandeville at NE of the open lake within the tree lined border	SP 538 453	Tree and scrub line lake with well-connected hedgerows bordering arable and improved/ poor semi improved grasslands.																
Date (night monitoring commenced to night monitoring ceased)	Species	Pp	P py	Pn	P sp. .	M b	M d	Mn	M m	Mb r	Mm/ Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep	
	Peak count in one night over month (May)	115	7	0	2	0	0	0	0	0	9	0	0	0	0	0	0	3	
	Number of nights detector deployed																		
30th April – 1st May 2013	1	17	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	
1st – 6th May 2013	6	411	24	0	2	0	0	0	0	0	37	0	0	0	0	0	0	5	
[1] Pp - common pipistrelle, P py - soprano pipistrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - <i>Myotis</i> bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - <i>Nyctalus</i> / <i>Eptesicus</i> bat.																			

2.4.360 Common pipistrelles were recorded in moderate to high numbers during May 2013 with a peak count of 411ppn. Low levels of activity were noted for soprano pipistrelle, pipistrelle species, *Myotis* species and *Nyctalus*/ *Eptesicus* bats during this month. No other species were recorded.



## Discussion

### *Bat Assemblage*

2.4.361 Field survey records confirmed the presence of at least nine bat species in this area. Common pipistrelle, soprano pipistrelle, brown long-eared bat and Natterer's bat were recorded during survey work. Desk study records also confirm the presence of these species. Whiskered bat, Brandt's bat, noctule, *Nathusius' pipistrelle*, and serotine bat were all recorded during surveys in 2012 and 2013.

2.4.362 Common and soprano pipistrelles, and brown long-eared bats are common and widespread species within this area. They are typically associated with the lowland arable and woodland habitat found in this area. However, maternity roosts of these species are notable and are, therefore, important in maintaining the population of these species.

2.4.363 The bat assemblage present in the area also contains rare and uncommon species with restricted distributions and/or low to moderate population estimates; these include *Nathusius' pipistrelle* and Brandt's bat which are classified as rare, and Leisler's bat and serotine bats which are classified as scarce and uncommon species, respectively.

### *Roosts*

2.4.364 Two tree roosts were identified from field surveys, both of which are located within one site; Fox Covert (Glyn Davis Wood). These roosts consist of a noctule maternity roost and a common pipistrelle summer roost. Both roosts were located in bat boxes and identified from emergence surveys and subsequent incidental records. The noctule maternity roost is located to the western side of the wood and the common pipistrelle roost is located in the centre of wood. Both roosts are located within land required for the Proposed Scheme.

2.4.365 Nine building roosts were confirmed. A transitional roost for a Natterer's bat, and a single common pipistrelle bat and brown long-eared bat were identified in a barn at Culworth Grounds Farm, 25m from land required for the construction of the Proposed Scheme. A brown long-eared bat maternity roost and pipistrelle species were located in two residential properties at Lower Thorpe Farm. Both roosts were located within 25m from land required for the construction of the Proposed Scheme. In addition, a day roost for brown long-eared bats was located in a building south of Lower Thorpe Farm and within 25m of land required for the construction of the Proposed Scheme. A brown long-eared bat maternity roost and Brandt's bat day roost were located in a residential building in Greatworth. However, these are located approximately 750m from land required for the construction of the Proposed Scheme. A second brown long-eared maternity roost was identified in a warehouse at Greatworth Park, south of the B4525, which is located 750m from land required for the construction of the Proposed Scheme.

2.4.366 Desk study records for several bat roosts were obtained from Northamptonshire Bat Group and include:

- brown long-eared, common pipistrelle and Natterer's bat roosts at Edgcote

Farm; and

- brown long-eared bat roost near Banbury Lane, Thorpe Mandeville.

### *Foraging Habitat*

2.4.367 The landscape in this area comprises mixed agricultural fields with small areas of woodland near Halse Copse and Danesmoor Spinney and established hedgerows. Watercourses that provide further foraging habitat for bats include the River Cherwell, Lower Thorpe Brook and the Boddington Feeder Canal. Bat populations of species known to be present in this area are likely to use these areas for foraging.

2.4.368 Key foraging and commuting habitats for common pipistrelle, soprano pipistrelle. Natusius' pipistrelle, Natterer's bats and *Myotis* bats were identified along tree lines and along the River Ouse tributary connecting to the northern section of Halse Copse; hedgerows linking to the south of Halse Copse; and tree lines extending eastwards.

2.4.369 Key foraging and commuting habitat for common and soprano pipistrelles, a *Nyctalus/Eptesicus* bat and *Myotis* species was also recorded along the tree-line at Greatworth disused railway to the north-west of Greatworth Hall, and along a hedgerow extending north-west towards Greatworth to a small copse of trees, near Helmdon Road.

2.4.370 Common and soprano pipistrelles, *Nyctalus/Eptesicus* bats and Natterer's bats were also recorded foraging and commuting along the peripheries of the woodland south-west of Culworth Grounds Farm and associated ponds, tree lines and hedgerows.

2.4.371 The presence of rarer species, the overall quality of the habitat present and its proximity to roosts, are factors contributing to the importance of foraging habitat in this area.

### *Commuting Habitat*

2.4.372 The hedgerow network in this area is well-connected and long established and, along with the watercourses cited above, provides an extensive network of habitat features suitable for commuting bats.

2.4.373 Two disused railways supporting scrub, grassland and woodland are present at Aston Le Walls and Lower Thorpe. Static monitoring survey at Lower Thorpe recorded moderate to high levels of common pipistrelle activity. Soprano pipistrelles, *Myotis* species and *Nyctalus/Eptesicus* were recorded in low numbers. This activity is likely to pertain to both commuting and foraging. Commuting activity was also recorded, including that of Natusius' pipistrelles along a line of trees near Halse Copse, and common pipistrelles along a hedgerow to the south-east of Halse Copse and along the disused railway to the north-west of Greatworth Hall. Natterer's bats were recorded along a hedgerow connecting the northern and southern sections of Halse Copse. Fox Covert (Glyn Davis Wood) is located in close proximity to small fragmented woodland and watercourses which are bounded by well-connected hedgerows; emergence surveys detected low to moderate levels of commuting and foraging activity from noctules, common pipistrelles and brown long-eared bats in this location.

2.4.374 The levels of bat activity and species composition recorded in this area in conjunction with the extent and quality of commuting habitat are fundamental factors contributing to the importance of commuting habitat in this area.

## 3 Otter

### 3.1 Introduction

3.1.1 This section of the appendix presents details of baseline information relating to otter for the section of the land required for the construction of the Proposed Scheme that will pass through CFA7 to CFA15 inclusive.

### 3.2 Methodology

3.2.1 Details of the standard methodology utilised for otter surveys are provided in the Technical Note HS2 Ecological Surveys: Field Survey Methods and Standards which is included as an appendix to Volume 1.

3.2.2 Desk study records relating to otter within 5km of the land required for the construction of the Proposed Scheme were obtained from the following sources:

- Bedfordshire, Cambridgeshire and Northamptonshire Wildlife Trust;
- Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT);
- Buckinghamshire County Council (BMERC);
- Greenspace Information for Greater London (GIGL);
- Hertfordshire Biological Records Centre (HBRC);
- Northamptonshire Biodiversity Records Centre;
- Northamptonshire County Council;
- Oxfordshire County Council; and
- Thames Valley Environmental Records Centre (TVERC).

3.2.3 In addition to the standard field signs stated in the Field Survey Methods and Standards, 'lying up' sites were also recorded during surveys. These were defined as cavities in river banks which are less than 1m deep and thus cannot be recorded as holts<sup>39</sup> but may be used by otter for resting or sheltering. Lying up sites have only been recorded where spraiting was also recorded in close proximity to the site.

3.2.4 Otters can use a wide variety of habitats to move through the landscape including large and small rivers and their tributaries and other water bodies, including wet ditches and ponds. Terrestrial habitat features in close proximity to water, such as woodlands, hedgerows and dry ditches may also be used. For the purpose of these surveys, a precautionary approach was taken and the majority of habitats were scoped in for detailed survey following the initial habitat suitability appraisal. Table 88 below summarises those sites that were scoped in for a detailed survey.

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<sup>39</sup> Criteria for classifying otter holts and potential otter holts are provided in the Field Survey Methods and Standards document.

3.2.5 Assessment of terrestrial otter breeding habitat was undertaken using the method adapted by Chanin from Liles (2003). Potential terrestrial breeding habitat must meet the following criteria;

- any single area of extensive concealing habitat (woodland, scrub, reedbed) which is greater than 1ha in area and within 100m of a watercourse;
- any combination of extensive concealing habitat which are within 100m of one another, total at least 1ha and are within 100m of a watercourse; and
- a range of other criteria including quality of food supply and cover were also assessed.

3.2.6 Only poor quality habitats where there was little vegetative cover, poor food resources and/or poor connectivity have been scoped out. Where watercourses or water bodies have been scoped out of detailed survey, the relevant information is provided to explain the rationale for this in the text for each CFA in the Baseline section. Scoped out sites are not listed in Table 1.

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Table 88: Summary of features subject to otter survey

Watercourse or water body and site name	Feature type	OS grid reference (start and finish)	Level of access within required survey extent <sup>40</sup>	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
River Colne (Broadwater Lake) - Land and buildings at Broadwater Park	Lake	TQ043884	Full	020-OT1-027001	28 November 2012	7	Within the Proposed Scheme
River Colne (Long Pond Lake)	Lake	TQ042888	Moderate	020-OT1-028002	21-May-13	7	Within the Proposed Scheme
River Colne (Korda Lake)	Lake	TQ045886	Moderate	020-OT1-028003	21-May-13	7	Within the Proposed Scheme
River Colne (Tilehouse South Lake)	Lake	TQ039895	Moderate	020-OT1-029004	21-May-13	7	Within the Proposed Scheme
River Colne (Bluewater Lake)	Lake	TQ043892	Moderate	020-OT1-028005	21-May-13	7	54m (north-east)
River Colne	River	TQ044883 to TQ039900	Moderate	020-OT1-027006	21-May-13	7	Within the Proposed Scheme
River Colne (land east of Denham Way)	River	TQ037901 to TQ036902	Moderate	020-OT1-029001	25-Mar-13	7	20m (west)
River Colne (land north-east of Link Way, Denham)	River	TQ042882	Full	020-OT1-027007	23-May-13	7	246m (north-east)
River Colne (land to the north-east of Denham Way)	River	TQ030915 to TQ033906	Moderate	020-OT1-030001	22-May-13	7	Within the Proposed Scheme
River Misbourne (Shardeloes Lake)	River	SU942980	Full	020-OT1-041001	27-Jun-13	8	Within the Proposed Scheme
River Thame (Stoke Brook) - land to the north of Nash Lee Lane	Stream	SP837009	Full	020-OT1-056003	1-Feb-13	10	Less than 5m (west)
River Thame (Stoke Brook) - Flint Cottage, Nash Lee Green	Stream	SP843088 to SP843087	Moderate	020-OT1-056004	12-Jun-13	10	70m (north-east)

<sup>40</sup> Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%).

Watercourse or water body and site name	Feature type	OS grid reference (start and finish)	Level of access within required survey extent <sup>40</sup>	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
River Thame (Stoke Brook) - the orchard, north of Nash Lee Road, Terrick, Ellesborough	Stream	SP844091 to SP846093	Moderate	020-OT1-056001	6-Jun-13	10	Within the Proposed Scheme
River Thame (Stoke Brook) - land at Whitethorn Farm, Old Risborough Road	Brook	SP832099 to SP833097	Moderate	020-OT1-057003	7-May-13	11	Within the Proposed Scheme
River Thame (Pond near Bear Brook) - Aylesbury Park Golf Club	Pond	SP801126	Moderate	020-OT1-062001	8-May-13	11	30m (south-west)
River Thame (Pond near Bear Brook) - Aylesbury Park Golf Club	Pond	SP800130	Moderate	020-OT1-062002	8-May-13	11	175m (south-west)
River Thame (Pond near Bear Brook) - Aylesbury Park Golf Club	Pond	SP799734	Moderate	020-OT1-063003	8-May-13	11	123m (south)
River Thame (Ditch near Bear Brook) - Aylesbury Park Golf Club	Ditch	SP799133 to SP797128	Moderate	020-OT1-062004	8-May-13	11	Within the Proposed Scheme
River Thame (Pond near Bear Brook) - Aylesbury Park Golf Club	Pond	SP797131	Moderate	020-OT1-063001	8-May-13	11	Within the Proposed Scheme
River Thame (Pond near Bear Brook) - Aylesbury Park Golf Club	Pond	SP798133	Moderate	020-OT1-063002	8-May-13	11	69m (south-east)
River Thame (Pond near Bear Brook) - Aylesbury Park Golf Club	Pond	SP798134	Moderate	020-OT1-063004	8-May-13	11	165m (south-east)
River Thame (Pond near Bear Brook) - Aylesbury Park Golf Club	Pond	SP797135	Moderate	020-OT1-063005	8-May-13	11	317m (south-west)
River Thame (Pond near Bear Brook) - Aylesbury Park Golf Club	Pond	SP795135	Moderate	020-OT1-063006	8-May-13	11	114m (south-west)
River Thame (Pond near Bear Brook) - Aylesbury Park Golf Club	Pond	SP792135	Moderate	020-OT1-063007	8-May-13	11	Within the Proposed Scheme

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Watercourse or water body and site name	Feature type	OS grid reference (start and finish)	Level of access within required survey extent <sup>40</sup>	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
River Thame (Pond near Bear Brook) - Aylesbury Park Golf Club	Pond	SP792138	Moderate	020-OT1-063008	8-May-13	11	20m (east)
River Thame (Pond near Fleet Marston Brook) - Sunset Cottage, Cranwell Farm	Pond	SP765163	Full	020-OT1-067001	28-Jan-13	11	Within the Proposed Scheme
River Thame (Stoke Brook) - land adjoining Hall End Farm, Lower Road	No water on site	SP482210	Majority	020-OT1-058003	26-Jun-13	11	19m (north-east)
River Thame (Stoke Brook) - land and buildings adjoining Stoke House, Risborough Road	Stream	SP837096 to SP841092	Full	020-OT1-057001	12-Jun-13	11	Within the Proposed Scheme
River Thame (Stoke Brook) - land to the north-east of Standalls Farm, Stoke Mandeville	Stream	SP815110 to SP818108	Full	020-OT1-059001	7-May-13	11	Within the Proposed Scheme
River Thame (Sedrup Ditch) - land to the south-east of Anton Way, Aylesbury	Stream	SP818110 to SP818110	Moderate	020-OT1-060001	6-Jun-13	11	No water on site
River Thame (Stoke Brook) - land at Stoke Farm, Stoke Mandeville	Stream	SP821107 to SP817109	Moderate	020-OT1-059002	27-Jun-13	11	Within the Proposed Scheme
River Thame (Fleet Marston Brook) - land to both the south and north of the A41 Fleet Marston	Stream	SP773163 to SP776155	Full	020-OT1-066001	28-Jan-13	11	Within the Proposed Scheme
River Thame (Fleet Marston Brook) - land to both the south and north of the A41 Fleet Marston	Stream	SP773155 to SP774163	Full	020-OT1-066002	28-Jan-13	11	Within the Proposed Scheme
River Thame (Lake - Sedrup Ditch) - Hartwell House	Lake	SP796126 to SP796126	Full	020-OT1-062006	6-Jun-13	11	Within the Proposed Scheme
River Thame (Wet Woodland) - Hartwell House	Wet Woodland	SP797128 to SP797126	Full	020-OT1-062007	6-Jun-13	11	Within the Proposed Scheme

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River Thame (Wet Woodland) - Hartwell House	Wet Woodland	SP797128 to SP797126	Full	020-OT1-062003	6-Jun-13	11	86m (north-east)
River Thame (Pond near Sedrup Ditch) - Hartwell House	Pond	SP796123 to SP796123	Full	020-OT1-062008	6-Jun-13	11	195m (south-east)
River Thame (Stoke Brook) - land to the south-west of Lower Road, Stoke Mandeville	Stream	SP825105 to SP826104	Majority	020-OT1-058001	7-May-13	11	82m (south-west)
River Thame (Bear Brook) - Putlowes Farm, Fleet Marston, Aylesbury	Stream	SP783149 to SP784145	Full	020-OT1-065001	23-May-13	11	Within the Proposed Scheme
River Thame (Sedrup Ditch) - Hartwell Depot, Oxford Road, Hartwell	Stream	SP804124 to SP803125	Moderate	020-OT1-062005	30-May-13	11	Within the Proposed Scheme
River Thame (Sedrup Ditch) - land to the south of Tyne Road, Aylesbury	Stream	SP814113 to SP815110	Moderate	020-OT1-060002	27-Mar-13	11	Less than 5m (south-east)
River Thame (Stoke Brook) -land at Yew Tree Farm, Stoke Mandeville	Stream	SP828103 to SP832100	Moderate	020-OT1-058002	27-Jun-13	11	Within the Proposed Scheme
River Thame (Stoke Brook) -land at Yew Tree Farm, Stoke Mandeville	Stream	SP836098 to SP840099	Moderate	020-OT1-057004	27-Jun-13	11	30m (south-west)
River Ray - land at Finemere Wood, Quainton	River	SP718216 to SP717221	Moderate	020-OT1-074005	25-Jun-13	12	61m (south)
River Thame (Sedrup Ditch) - Hartwell Estate Land	Stream	SP797118 to SP804119	Majority	020-OT1-061001	23-May-13	11	Within the Proposed Scheme
Doddershall Brook (Ditch) - land to the north-east of Quainton Road, Quainton	Ditch	SP734189 to SP734189	Full	020-OT1-071001	25-Mar-13	12	Within the Proposed Scheme
Doddershall Brook (Ditch) - land to the north-east of Quainton Road, Quainton	Ditch	SP734190 to SP734191	Full	020-OT1-071002	25-Mar-13	12	Within the Proposed Scheme

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Doddershall Brook (Ditch) - land to the north-east of Quainton Road, Quainton	Ditch	SP734191 to SP734192	Full	020-OT1-071003	25-Mar-13	12	Within the Proposed Scheme
Tetchwick Brook (Drain) - land to the north-west of Station Road, Quainton	Drain	SP737191 to SP738191	Full	020-OT1-071004	25-Mar-13	12	43m (north)
River Ray - land at Woodlands Farm, Edgcott Road, Quainton	River	SP715210	Full	020-OT1-074002	23-Apr-13	12	24m (north)
River Ray - Oaktree Farm, Quainton, Aylesbury	River	SP709216 to SP710215	Full	020-OT1-075003	25-Jun-13	12	Within the Proposed Scheme
River Ray - land to the north of the Edgcott to Quainton road	River	SP711210 to SP709210	Moderate	020-OT1-074001	26-Mar-13	12	Within the Proposed Scheme
River Ray - Woodlands Farmhouse, Doddershall, Quainton	River	SP718213 to SP711210	Moderate	020-OT1-074003	19-Jun-12	12	Within the Proposed Scheme
River Ray - land at Woodlands Farm, Edgcott Road, Doddershall	River	SP718213 to SP711210	Moderate	020-OT1-074004	19-Jun-12	12	Within the Proposed Scheme
River Ray (Pond) - land at Woodlands Farm, Edgcott Road, Quainton, Aylesbury	Pond	SP713216	Moderate	020-OT1-074008	28-Jan-13	12	Within the Proposed Scheme
River Ray - land at Woodlands Farm, Edgcott Road, Quainton	River	SP716211 to SP716212	Moderate	020-OT1-074007	23-Apr-13	12	Within the Proposed Scheme
River Ray - Woodlands Lodge, Doddershall	River	SP718213 to SP711210	Moderate	020-OT1-074006	19-Jun-12	12	Within the Proposed Scheme
Padbury Brook - Chetwode Priory, Finmere	River	SP640297 to SP640296	Majority	020-OT1-086001	30-Jan-13	13	Within the Proposed Scheme
Padbury Brook - Chetwode Priory, Finmere	River	SP640296 to SP642296	Majority	020-OT1-086002	30-Jan-13	13	Within the Proposed Scheme
Padbury Brook - Seven Stars Cottage,	River	SP673267 to	Moderate	020-OT1-081001	27 March	13	Within the Proposed Scheme

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Twyford Road, Twyford		SP674267			2013		
Padbury Brook - Seven Stars Cottage, Twyford Road, Twyford	River	SP674267 to SP675268	Moderate	020-OT1-081002	27-Mar-13	13	Within the Proposed Scheme
Padbury Brook (Pond) - land adjoining Chetwode Priory, Finmere	Pond	SP642300	Moderate	020-OT1-085002	27-Mar-13	13	295m (south-west)
Padbury Brook - land adjoining Chetwode Priory, Finmere	River	SP642295 to SP643300	Moderate	020-OT1-085001	27-Mar-13	13	Within the Proposed Scheme
Padbury Brook - Three Bridge Mill, Twyford	River	SP673268 to SP674268	Little	020-OT1-081013	29-Jan-13	13	Within the Proposed Scheme
Padbury Brook - Barton Grounds Farm, Newton Purcell	River	SP628298 to SP632304	Moderate	020-OT1-086006	30-Jan-13	13	Within the Proposed Scheme
Padbury Brook (Pond) - The Old Red Lion, Church Street, Twyford	Pond	SP664265	Moderate	020-OT1-082004	27-Mar-13	13	260m (north-east)
Padbury Brook - land and buildings on the east side of School Lane	River	SP666264 to SP667265	Moderate	020-OT1-081014	2-May-13	13	Within the Proposed Scheme
River Ray - Calvert Waste Terminal (Woods) C	River	SP703217 to SP706220	Majority	020-OT1-075004	1 May 2013	13	Within the Proposed Scheme
River Ray (Muxwell Brook Drain) - Calvert	Drain	SP703217 to SP706221	Majority	020-OT1-075005	1 May 2013	13	85m (north-east)
River Ray (Drain) and Calvert Jubilee - Calvert landfill [Calvert Jubilee LNR]	Drain	SP682251 to SP687247	Majority	020-OT1-080006	1 May 2013	13	Within the Proposed Scheme
Calvert- Clay Pits	Lake	SP698228	Moderate	020-OT1-077001	28-Jan-13	13	182m (north-east)
Grebe Lake - land on the north side of School Hill, Charndon	Lake	SP677250	Little	020-OT1-079001 and 020-OT1-	30-May-13	13	61m (east)

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Watercourse or water body and site name	Feature type	OS grid reference (start and finish)	Level of access within required survey extent <sup>40</sup>	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
				080001		13	
Padbury Brook - Home Farm House, Main Street, Twyford, Buckinghamshire	River	SP667264 to SP671267	Moderate	020-OT1-081011	12-Jun-13	13	Within the Proposed Scheme
Padbury Brook - Home Farm House, Main Street, Twyford, Buckinghamshire	River	SP672268 to SP667270	Moderate	020-OT1-081012	12-Jun-13	13	43m (south)
Padbury Brook (Pond) - Home Farm House, Main Street, Twyford, Buckinghamshire	Pond	SP669263	Moderate	020-OT1-081003	12-Jun-13	13	148m (north-west)
Padbury Brook - Home Farm House, Main Street, Twyford, Buckinghamshire	River	SP664262 to SP671262	Moderate	020-OT1-081004	12-Jun-13	13	Within the Proposed Scheme
Padbury Brook (Pond) - Home Farm House, Main Street, Twyford, Buckinghamshire	Pond	SP667266	Moderate	020-OT1-081005	12-Jun-13	13	27m (north-east)
Padbury Brook (Pond) - Home Farm House, Main Street, Twyford, Buckinghamshire	Pond	SP671266	Moderate	020-OT1-081006	12-Jun-13	13	Within the Proposed Scheme
Padbury Brook (Pond) - Home Farm House, Main Street, Twyford, Buckinghamshire	Pond	SP670267	Moderate	020-OT1-081007	12-Jun-13	13	50m (south-west)
Padbury Brook - Home Farm House, Main Street, Twyford, Buckinghamshire	River	SP671267 to SP672268	Moderate	020-OT1-081008	12-Jun-13	13	5m (south)
Padbury Brook (Pond) - Home Farm House, Main Street, Twyford, Buckinghamshire	Pond	SP667264	Moderate	020-OT1-081009	12-Jun-13	13	Within the Proposed Scheme
Padbury Brook - Home Farm House, Main Street, Twyford, Buckinghamshire	River	SP667270 to SP667269	Moderate	020-OT1-081010	12-Jun-13	13	Within the Proposed Scheme
Padbury Brook - land at Home Farm, Barton Hartshorn	River	SP637314 to SP632306	Moderate	020-OT1-087001	26-Jun-13	13	Within the Proposed Scheme
Padbury Brook (Pond) - Poplars Farm, Main Street and land to the north-east of Portway	Pond	SP666263	Moderate	020-OT1-081015	5-Jun-13	13	Within the Proposed Scheme

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Road, Twyford							
Padbury Brook - Poplars Farm, Main Street and land to north-east of Portway Road, Twyford	River	SP668263 to SP666264	Moderate	020-OT1-081016	5-Jun-13	13	Within the Proposed Scheme
Padbury Brook - Shepherd's Furze Farm, Steeple Claydon	River	SP689257 to SP685253	Moderate	020-OT1-079003	28-Jun-13	13	Within the Proposed Scheme
Padbury Brook (Drain) - Stone Court Farm, West Street, Steeple Claydon	Drain	SP683265 to SP686264	Majority	020-OT1-080005	29-May-13	13	Within the Proposed Scheme
Padbury Brook - Cowley Farm, Preston Bissett, Buckingham	River	SP663273 to SP662278	Moderate	020-OT1-082001	27-Mar-13	13	10m (south-east)
Padbury Brook (Pond) - Cowley Farm, Preston Bissett, Buckingham	Pond	SP662280	Majority	020-OT1-082002	27-Mar-13	13	664m (south-west)
Padbury Brook (Pond) - Cowley Farm, Preston Bissett, Buckingham	Pond	SP662274	Moderate	020-OT1-082003	27-Mar-13	13	185m (south-west)
Padbury Brook (Lake) - Barton Hill Farm, Newton Purcell, Buckingham	Lake	SP631302 to SP632303	Moderate	020-OT1-086007	30-Jan-13	13	Within the Proposed Scheme
Padbury Brook - Portway Farm, Twyford, Buckingham	River	SP677263 to SP677263	Moderate	020-OT1-080002	28-Jun-13	13	Within the Proposed Scheme
Padbury Brook - Portway Farm, Twyford, Buckingham	River	SP670257 to SP671259	Moderate	020-OT1-080003	28-Jun-13	13	170m (east)
Padbury Brook - Portway Farm, Twyford, Buckingham	River	SP670257 to SP670253	Moderate	020-OT1-080004	28-Jun-13	13	135m (north-east)
Padbury Brook (Pond) The Hermitage, Chetwode	Pond	SP639295 to SP639295	Majority	020-OT1-086003	30-Jan-13	13	Within the Proposed Scheme

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Padbury Brook (Ditch) The Hermitage, Chetwode	Ditch	SP638296 to SP639296	Full	020-OT1-086004	30-Jan-13	13	72m (south-west)
Padbury Brook (Pond) The Hermitage, Chetwode	Pond	SP638296 to SP638296	Full	020-OT1-086005	30-Jan-13	13	Within the Proposed Scheme
Padbury Brook (Stream) - Grange Farm, Goddington	Stream	SP647271 to SP648273	Moderate	020-OT1-083001	13-Jun-13	13	541m (north-east)
Padbury Brook (Ditch) - Grange Farm, Goddington	Ditch	SP648273 to SP653274	Moderate	020-OT1-083002	13-Jun-13	13	275m (north-east)
Padbury Brook (Ditch) - Grange Farm, Goddington	Ditch	SP649275 to SP649277	Moderate	020-OT1-083003	13-Jun-13	13	190m (east)
Padbury Brook (Ditch) - Grange Farm, Goddington	Ditch	SP650275 to SP651278	Moderate	020-OT1-083004	13-Jun-13	13	50m (east)
Padbury Brook - Grange Farm, Goddington	River	SP650276 to SP648273	Majority	020-OT1-083005	13-Jun-13	13	83m (north-east)
Padbury Brook - land known as Cowley Farm	River	SP662275 to SP663271	Full	020-OT1-082005	24-Jun-13	13	Within the Proposed Scheme
River Great Ouse - land to the rear of Turweston Lodge	River	SP599379 to SP599379	Majority	020-OT1-095001	4-Jun-13	13	191m (north-east)
River Great Ouse (Lake) - Cold Harbour Farm, Radstone, Brackley	Lake	SP602403	Majority	020-OT1-097001	25-Jun-13	14	955m (south-west)
River Great Ouse - Cold Harbour Farm, Radstone, Brackley	River	SP601404 to SP597407	Moderate	020-OT1-097002	25-Jun-13	14	820m (south-west)
River Great Ouse - Cold Harbour Farm, Radstone, Brackley	River	SP599405 to SP591401	Full	020-OT1-097003	25-Jun-13	14	23m (south-west)
River Great Ouse (Ditch) - land to the west of	Ditch	SP586401 to	Moderate	020-OT1-097004	10-Jun-13	14	Within the Proposed Scheme

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the Brackley to Helmdon road		SP580399					
River Great Ouse (Ditch) - land to the west of the Brackley to Helmdon road	Ditch	SP585392 to SP584394	Moderate	020-OT1-097005	10-Jun-13	14	56m (north)
River Great Ouse (Ditch) - land to the west of the Brackley to Helmdon road	Ditch	SP584409 to SP579408	Moderate	020-OT1-098001	10-Jun-13	14	Within the Proposed Scheme
River Great Ouse - land at Tibbetts Farm, Church Lane, Mixbury, Brackley	River	SP608343 to SP618345	Majority	020-OT1-091003	10-Jun-13	14	Within the Proposed Scheme
Finmere Quarry (Lake)	Lake	SP 625326	Little	020-OT1-089001	24-Jun-13	14	22m (north)
Finmere Quarry (Pond)	Pond	SP 625324	Moderate	020-OT1-089002	24-Jun-13	14	18m (south-west)
Finmere Quarry (Lake)	Lake	SP 626323	Moderate	020-OT1-089003	24-Jun-13	14	8m (south-west)
Finmere Quarry (Pond)	Pond	SP 627321	Moderate	020-OT1-089004	24-Jun-13	14	64m (south-west)
Finmere Quarry (Pond)	Pond	SP 627321	Moderate	020-OT1-089005	24-Jun-13	14	98m (south-west)
Finmere Quarry (Pond)	Pond	SP 627322	Moderate	020-OT1-089006	24-Jun-13	14	192m (south-west)
Finmere Quarry (Pond)	Pond	SP 627323	Moderate	020-OT1-089007	24-Jun-13	14	193m (south-west)
Finmere Quarry (Lake)	Lake	SP 629323	Moderate	020-OT1-089008	24-Jun-13	14	333m (south-west)
Finmere Quarry (Pond)	Pond	SP 629321	Moderate	020-OT1-089009	24-Jun-13	14	273m (south-west)
Finmere Quarry (Pond)	Pond	SP629321	Moderate	020-OT1-089010	24-Jun-13	14	269m (south-west)
River Great Ouse (Lake) - land at Westbury, Brackley	Lake	SP622351	Majority	020-OT1-091001	25-Jun-13	14	753m (south-west)
River Great Ouse - land at Westbury, Brackley	River	SP623350 to SP616352	Moderate	020-OT1-091002	25-Jun-13	14	25m (west)

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River Great Ouse - Greatworth Hall Farm, Helmdon Road, Greatworth, Northamptonshire	River	SP559426 to SP558425	Moderate	020-OT1-101001	31-Jan-13	15	Within the Proposed Scheme
River Great Ouse - Greatworth Hall, Greatworth, Northamptonshire	River	SP562427	Moderate	020-OT1-101002	27-Mar-13	15	Within the Proposed Scheme - 300m
River Cherwell - Redhill Farm, Banbury Road, Chipping Warden, Daventry	River	SP503500 to SP505497	Moderate	020-OT1-110001	27-Jun-13	15	75m (south-west)
River Cherwell (Pond) - Redhill Farm, Banbury Road, Chipping Warden, Daventry	Pond	SP502500	Moderate	020-OT1-110002	27-Jun-13	15	80m (north-west)
River Cherwell (Stream) - Thorpe Mandeville Court, Thorpe Mandeville, Banbury	Stream	SP535448 to SP534448	Moderate	020-OT1-104001	1-Feb-13	15	Less than 5m (north-east)
River Cherwell (Pond) - Thorpe Mandeville Court, Thorpe Mandeville, Banbury	Pond	SP535448	Moderate	020-OT1-104002	28-May-13	15	13m (north-east)
River Cherwell (Pond) - Thorpe Mandeville Court, Thorpe Mandeville, Banbury	Pond	SP535448	Moderate	020-OT1-104003	28-May-13	15	35m (north-east)
River Cherwell (Stream) - Thorpe Mandeville Court, Thorpe Mandeville, Banbury	Stream	SP534448 to SP533447	Moderate	020-OT1-104004	28-May-13	15	212m (north-east)
River Cherwell (Pond) - Thorpe Mandeville Court, Thorpe Mandeville, Banbury	Pond	SP532448	Full	020-OT1-104005	28-May-13	15	140m (north-east)
River Cherwell - land to the north-west of Lower Thorpe Farm	River	SP535455 to SP535457	Moderate	020-OT1-105001	11-Jun-13	15	Within the Proposed Scheme
River Great Ouse - Halse Grange Farm, Halse	River	SP578418 to SP582416	Moderate	020-OT1-099001	12-Jun-13	15	31m (south-east)
River Great Ouse - Halse Grange Farm, Halse	River	SP582415 to SP575411	Moderate	020-OT1-099002	12-Jun-13	15	Within the Proposed Scheme

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River Great Ouse - land to the north of Helmdon road, Greatworth and land at Floyds Farm, Greatworth.	River	SP554420 to SP557424	Moderate	020-OT1-101003	27-Mar-13	15	206m (north-east)
River Cherwell - land to the west of Banbury Lane, Thorpe Mandeville, Banbury	River	SP532458 to SP535456	Moderate	020-OT1-105005	31-Jan-13	15	Within the Proposed Scheme
River Cherwell - land at Culworth	River	SP522479 to SP523480	Moderate	020-OT1-108001	14-Jun-13	15	220m (south-west)
Oxford Canal - land to the south-west of the Wormleighton to Upper Boddington road	Canal	SP468525 to SP466527	Moderate	020-OT1-115001	29-May-13	15	Within the Proposed Scheme
River Great Ouse - land and buildings at Greatworth, Banbury	River	SP551439 to SP554439	Majority	020-OT1-103001	1-Feb-13	15	73m (south-west)
River Cherwell - land at Culworth Trafford Bridge Marsh	River	SP518478 to SP522479	Moderate	020-OT1-108002	14-Jun-13	15	Less than 5m (south-east)
River Cherwell - Culworth Grounds Farm, Thorpe Mandeville	River	SP536462 to SP532458	Moderate	020-OT1-105004	24-Apr-13	15	Within the Proposed Scheme
River Great Ouse - land at Floyds Farm, Greatworth	River	SP554420 to SP557424	Majority	020-OT1-101003	27-Mar-13	15	206m (north-east)
Oxford Canal - Manor Farm, Banbury Road, Lower Boddington, Daventry	Canal	SP482517 to SP483517	Moderate	020-OT1-113001	27-Jun-13	15	55m (south-west)
Oxford Canal - Old House Farm, Banbury Road, Lower Boddington, Daventry	Canal	SP479519 to SP481518	Moderate	020-OT1-113003	27-Jun-13	15	5m (south-west)
Oxford Canal - Old House Farm, Banbury Road, Lower Boddington, Daventry	Canal	SP481507 to SP480505	Moderate	020-OT1-113004	27-Jun-13	15	43m (north-east)
Oxford Canal - land at Paradise Farm, Banbury Road, Lower Boddington, Daventry	Canal	SP480517 to SP482517	Moderate	020-OT1-103005	28-Jun-13	15	11m (south-west)

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Oxford Canal - Springfield Farm, Lower Bodddington	Canal	SP460510 to SP464506	Moderate	020-OT1-114001	28-Jun-13	15	1365m (north-east)
Oxford Canal - Springfield Farm, Lower Bodddington	Canal	SP460515 to SP468251	Moderate	020-OT1-114004	28-Jun-13	15	365m (north-east)
River Great Ouse (Claydon Brook) - Springfield Farm, Lower Bodddington	Stream	SP467508 to SP466510	Moderate	020-OT1-114002	28-Jun-13	15	1055m (east)
Oxford Canal - Fir Tree Nursery, Lower Bodddington	Canal	SP470521 to SP472523	Moderate	020-OT1-114003	03-May-13	15	Within the Proposed Scheme
River Cherwell (Stream) - Magpie Farm, Culworth, Banbury, Oxon	Stream	SP535449 to SP536450	Moderate	020-OT1-104006	26-Jun-13	15	Within the Proposed Scheme
River Cherwell (Pond) - Magpie Farm, Culworth, Banbury, Oxon	Pond	SP542450	Full	020-OT1-104007	26-Jun-13	15	72m (south-west)
River Cherwell (Pond) - Magpie Farm, Culworth, Banbury, Oxon	Pond	SP542451	Full	020-OT1-104008	26-Jun-13	15	145m (south)
River Cherwell (Pond) - Magpie Farm, Culworth, Banbury, Oxon	Pond	SP538453	Full	020-OT1-105009	26-Jun-13	15	Within the Proposed Scheme
River Cherwell (Pond) - Unregistered land to the south-east of Lower Thorpe Farm	Pond	SP539453	Moderate	020-OT1-104011	28-May-13	15	Within the Proposed Scheme
River Cherwell (Pond) - Unregistered land to the south-east of Lower Thorpe Farm	Pond	SP537453 to SP538453	Moderate	020-OT1-104010	28-May-13	15	Within the Proposed Scheme
River Cherwell (Stream) - Unregistered land to the south-east of Lower Thorpe Farm	Stream	SP537452 to SP536453	Moderate	020-OT1-105002	1-Feb-13	15	Within the Proposed Scheme
River Cherwell (Lake) - Unregistered land to the south-east of Lower Thorpe Farm	Lake	SP537453 to SP537452	Moderate	020-OT1-105003	1-Feb-13	15	Within the Proposed Scheme
River Cherwell (Drain) - Unregistered land to	Drain	SP536448 to	Moderate	020-OT1-104012	27-Mar-13	15	Within the Proposed Scheme

Watercourse or water body and site name	Feature type	OS grid reference (start and finish)	Level of access within required survey extent <sup>40</sup>	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
the south-east of the junction of Bulls Lane and Banbury Lane		SP541446					

### **3.3 Deviations, constraints and limitations**

3.3.1 Every effort was made to establish as complete a picture as possible of otter activity and to fully record the presence of otters and their resting places. However, the following constraints and limitations were encountered:

- field surveys were limited to locations where landowner permission had been obtained or areas that were accessible to the public. As a result, surveys were not undertaken at potentially suitable locations due to landowner access restrictions.
- surveys were carried out from both banks of the watercourse, where possible. However, at some locations access or health and safety constraints prevented this;
- at some locations topography and vegetation structure restricted surveys by reducing access and visibility, therefore there is the potential for evidence to have been under-recorded;
- in order to complete the maximum number of surveys within the available survey timeframe, some surveys were completed during periods when water levels were high and/or after periods of heavy rainfall. While signs of otter activity can still be detected under such conditions, evidence may be under recorded as field signs may have been washed away or be less visible, thus reducing the confidence in negative results obtained during these surveys; and
- due to limitations regarding land access within the available survey timeframe, it was not possible to carry out four survey visits to all sites or to carry out surveys at three-monthly intervals. This resulted in fewer opportunities for encountering otter field signs within a restricted survey season. Evidence of otter activity at the sites where fewer surveys were carried out, or where the interval between surveys was shorter, may be under recorded for these sites. This reduces the confidence in any negative results obtained during surveys at these sites.

3.3.2 Otters are highly mobile, range over large distances and have been found to be present on the majority of watercourses/water bodies surveyed. Therefore, in drawing conclusions on the presence of otters on watercourses/water bodies within each of the CFAs a precautionary approach has been adopted, taking into consideration the above deviations, constraints and limitations. For example, where access was restricted, or where fewer than four surveys were possible, if suitable habitat exists then it has been assumed that otters are present.

### **3.4 Baseline**

3.4.1 A summary of all positive evidence of otter is provided in Table 89.

Table 8g: Summary of all positive evidence of otter

Name of watercourse (and ecology survey code)	Location	OS grid reference	Nature of record	Distance from Proposed Scheme (m) and orientation
River Colne 020-OT2-028009	Denham	TQ039892	Potential holt	Within the Proposed Scheme
Sedrup Ditch 020-OT2-061004	Austin's Land Calley Farm Hartwell Estate	SP801116	Potential holt	313m (north-east)
Sedrup Ditch 020-OT2-061005	Austin's Land Calley Farm Hartwell Estate	SP802115	Potential holt	216m (north-east)
River Ray 020-OT2-075001	Oak Tree Farm	SP709217	Potential holt	24m (south-east)
Padbury Brook 020-OT2-081013	Disused railway, Twyford, Buckingham	SP667266	Potential Holt	Within the Proposed Scheme
River Great Ouse 020-OT2-092006	land at Westbury, Brackley	SP618353	Potential holt	224m (west)
River Great Ouse 020-OT2-092007	land at Westbury, Brackley	SP618353	Potential holt	200m (south-west)
River Great Ouse 020-OT2-099003	Halse Grange Farm	SP579414	Potential holt	Within the Proposed Scheme
River Cherwell - Pond on site 020-OT2-105001	Unregistered land at the south-east of Lower Thorpe Farm	SP537452	Potential holt	Within the Proposed Scheme
River Cherwell 020-OT2-105006	Culworth Grounds Farm	SP535457	Holt	106m (south-west)

## CFA 7 Colne Valley

### River Colne

3.4.2 Habitat suitable for otter in the Colne Valley includes the River Colne and a number of large lakes created by gravel extraction that are surrounded by semi-natural broadleaved woodland. These offer both sheltering and foraging resources in close proximity to one another. The entire study area was assessed as being highly suitable as a terrestrial breeding habitat for otter.

3.4.3 From east to west, land required for the construction of the Proposed Scheme crosses Harefield No. 2 Lake, Savay Lake, Korda Lake, Harefield Moor Lake, the River Colne and it passes within 50m of Broadwater Lake and Tilehouse Lake South. No water bodies or watercourses were scoped out of further survey following the habitat suitability appraisal.

3.4.4 No active otter holts were recorded in this area. Two lying up sites (TQ039892, TQ039891) and one potential holt (TQ039892) were located within land required for the construction of the Proposed Scheme. A fresh otter spraint was recorded along the River Colne under Moorhall Road approximately 216m north-east of the land required for the construction of the Proposed Scheme (TQ044882 and TQ044882), and 234m north-east of the land required for the construction of the Proposed Scheme at TQ044882. Anal jelly and possible feeding remains were found 26m south-west of the scheme, and also along the River Colne (TQ038893). A single otter spraint was recorded along the Grand Union Canal approximately 200m east of the land required for the construction of the Proposed Scheme (TQ049887).

3.4.5 No desk study records were provided for this area.

3.4.6 Areas around Savay Lake, Harefield No.2 Lake and the south of the Chiltern Railway along either side of the Grand Union Canal were not accessible for survey but may be suitable for otters. In addition to this, access to the bank of the watercourses where surveys took place was restricted due to dense vegetation cover.

3.4.7 Based on the results of field surveys, it is assumed that otter will make use of the River Colne for foraging and as a corridor for movement. They may also be present in other suitable aquatic and terrestrial habitat in the extent of the land required for the construction of the Proposed Scheme. Although, no confirmed otter holts or resting places were recorded, given the availability of suitable terrestrial habitat, there is scope for otter to breed in the extent of the land required for the construction of the Proposed Scheme in the future. It cannot be confirmed if any active otter holts are present in areas that could not be surveyed due to access restrictions (see section 1.4.5). Adopting a precautionary approach, it is assumed that otters are also using these watercourses/water bodies and it is also assumed that the locations support suitable terrestrial breeding habitat.

## CFA8 The Chalfonts and Amersham

### *River Misbourne Catchment*

3.4.8 Suitable otter habitat in this area includes the River Misbourne and Shardeloes Lake which is a man-made lake formed by partial damming of the River Misbourne. Shardeloes Lake is surrounded by wet woodland and swamp vegetation that was assessed as being highly suitable terrestrial breeding habitat.

3.4.9 The majority of the Proposed Scheme is in a bored tunnel under The Chalfonts and Amersham area (CFA8). Of those survey areas falling within land required for the construction of the Proposed Scheme, access was obtained for the stretch of the River Misbourne and Shardeloes Lake at the northern end of the area, but it was not possible to access the stretch of the River Misbourne to the east of Chalfont St Giles. No accessible water bodies or watercourses were scoped out of further survey following the habitat suitability appraisal.

3.4.10 Surveys of Shardeloes Lake in the north of this area did not record any evidence of otter. One otter spraint was found at a spot check location on the River Misbourne at the weir at Mop End Lane (SU934984) on the boundary between CFA8 and CFA9. This

location is approximately 246m from the land required for the construction of the Proposed Scheme.

- 3.4.11 There are no desk study records relating to this area.
- 3.4.12 Based on the results of field surveys, it is assumed that otters regularly make use of the River Misbourne for foraging and as a movement corridor. Due to the close proximity and connectivity of Shardeloes Lake to the River Misbourne, taking a precautionary approach, it is assumed that otters also use Shardeloes Lake. It is likely that otter would be present in the extent of the land required for the construction of the Proposed Scheme, in particular two sections of the River Misbourne at Shardeloes Lake and a section of the channel within the land required for the construction of the Proposed Scheme at Chalfont St Giles. There are some small areas of terrestrial habitat where vent shafts will be constructed (at Chalfont St Peter, Chalfont St Giles and Amersham). However, the closest vent shaft is located over 200m north of the River Misbourne, east of Little Missenden and is on the opposite side of a busy dual carriageway that would discourage otter movement. All other vent shafts are over 395m away from the River Misbourne.

### **CFA9 Central Chilterns**

- 3.4.13 There are no river catchments or suitable water bodies present in the Central Chilterns (CFA9), therefore, no areas were selected for otter field surveys.
- 3.4.14 No desk study records were provided for this area.

### **CFA10 Dunsmore, Wendover and Halton**

#### *The River Thame Catchment*

- 3.4.15 Suitable otter habitats in this area are restricted to the Stoke Brook and surrounding woodland and scrub. The Stoke Brook crosses the northern edge of the Dunsmore, Wendover and Halton area (CFA10) and is part of the River Thame catchment. Access was available for field survey along the Stoke Brook in all areas requiring survey. The small areas of woodland and scrub habitat recorded in close proximity to the Stoke Brook, at the orchard, north of Nash Lee Road (020-OT1-056005) south-east of Stoke Mandeville, were considered to be highly suitable terrestrial breeding habitat. The Stoke Brook was considered suitable for both otter movement and foraging habitat.
- 3.4.16 A single otter spraint was found approximately 10m upstream and south-west of where the land required for the construction of the Proposed Scheme crosses the Stoke Brook (SP846093) at the northernmost boundary of this area. No evidence of otter holts was found during inspections of terrestrial breeding habitat along the Stoke Brook.
- 3.4.17 No desk study records were provided for this area. It is assumed that otter make use of the Stoke Brook for foraging and as a movement corridor. This includes land required for the construction of the Proposed Scheme, which includes highly suitable terrestrial breeding habitat.

## CFA11 Stoke Mandeville and Aylesbury

### *The River Thame Catchment*

3.4.18 Suitable otter habitat in the Stoke Mandeville to Aylesbury area (CFA11) includes the Stoke Brook; the Sedrup Ditch; the Hartwell Ditch; the Lower Hartwell Ditch; and the Bear Brook. All of these watercourses ultimately flow into the River Thame, which also flows through this area. Woodland, which was considered to be highly suitable as a terrestrial breeding habitat for otter, was recorded around Lower Hartwell and on Aylesbury Park Golf Club. Remaining locations in this area were intensively farmed and of lower suitability.

3.4.19 Access was obtained to the majority of land required for survey within this area and the majority of water bodies or watercourses were scoped in for further survey following the habitat suitability appraisal. The Fleet Marston Brook was scoped out for further survey as it was a small drainage ditch which was narrow and shallow, with poor connectivity to other watercourses. A small pond at Fleet Marston was also scoped out due to the low cover for otter to use as a shelter and poor connectivity to other watercourses.

3.4.20 Field surveys recorded the following evidence of otter (distances are all relative to the land required for the construction of the Proposed Scheme):

- the Stoke Brook - one otter spraint was found as stated above under CFA10 (SP846093);
- the Sedrup Ditch - no evidence of otter was recorded. Two potential otter holts were identified 313m from the land required for the construction of the Proposed Scheme at Sedrup (SP801116) and 216m north-east (SP802115);
- water bodies at Lower Hartwell and Aylesbury Park Golf Club which include the Hartwell Ditch and the Lower Hartwell Ditch - no evidence of otter was found on any of these watercourses or water bodies. An area of woodland along the eastern edge of the golf course may be suitable terrestrial breeding habitat but was not accessed; and
- the Bear Brook - an otter spraint (SP793142) and mammal path (SP793142) were found under the bridge where Rabans Lane crosses Bear Brook at a location approximately 434m from land required for the construction of the Proposed Scheme. The Bear Brook is connected to the Sedrup Ditch, the Hartwell Ditch and the Lower Hartwell Ditch. No evidence of otter was found during surveys of terrestrial habitat around the Bear Brook.

3.4.21 A single desk study record of otter from 1998 refers to the River Thame, near Stone. It is 1.24km south-west of land required for the construction of the Proposed Scheme.

3.4.22 Otter have been confirmed on the Bear Brook and the Stoke Brook. Taking a precautionary approach, it is assumed that they would be able to use habitat on all other watercourses in this area given connectivity and the availability of suitable habitat (with the exception of ditches and ponds in the vicinity of Fleet Marston Brook due to the poor habitat quality and poor connectivity). Given the low incidence of

spraints, it may be the case that otter use of watercourses in this area is infrequent. There was no access to land in the area around Lower Hartwell and so it was not possible to confirm whether otter are present in potentially suitable breeding habitat. However, given the lower level of otter evidence across this area, it is unlikely.

## **CFA12 Waddesdon and Quainton**

### *The River Ray Catchment*

3.4.23 The majority of watercourses in this area were considered suitable to support otter. These included the River Ray and tributaries, including the Lee Wood Farm Ditch and the Muxbury Brook at Calvert (part of which is called the 'Mega Ditch'). Finemere Wood provides highly suitable terrestrial otter breeding habitat. It is adjacent to land required for the construction of the Proposed Scheme and is crossed by the River Ray.

3.4.24 Field surveys recorded the following evidence of otter:

- a single, old, otter spraint was found on the River Ray where it flows along the southern edge of Finemere Wood (SP720215) 55m from the land required for the construction of the Proposed Scheme. A potential holt was identified approximately 25m from the land required for the construction of the Proposed Scheme, to the west of Finemere Wood, but there was no evidence of it being used by otter (SP709217).

3.4.25 The desk study revealed three records of otters in this area. All records were along the Tetchwick Brook in the River Ray catchment and were from 2012. They are located 3.9km, 4.6km and 4.6km south-west of the land required for the construction of the Proposed Scheme and south-west of Grendon Underwood.

3.4.26 Three ditches and one pond on the north-eastern side of Quainton Road were scoped out for further survey following the habitat suitability appraisal. The ditches were narrow, shallow and poorly connected to other watercourses, and the pond was a small garden pond, also with poor connectivity to nearby watercourses. There was access to the River Ray catchment, but permission was restricted in the central part of the area to land west of Quainton.

3.4.27 Evidence of otter was confirmed on the River Ray and, given the large home range of this species, it must be assumed that otters make use of all watercourses in this area for foraging and as movement routes, including areas that could not be accessed for survey. The absence of spraint at the Muxbury Brook and the old age of the spraint identified on the River Ray suggest that otter use this area infrequently.

## **CFA13 Calvert, Steeple Claydon, Twyford and Chetwode**

### *The Padbury Brook Catchment*

3.4.28 Suitable otter habitats in this area include the Padbury Brook, ditches connecting to the Padbury Brook and two large lakes north-east of the village of Charndon (Grebe Lake and Calvert Jubilee Lake). Woodland and scrub around Grebe Lake and around Calvert Jubilee Lake were considered to be highly suitable as otter terrestrial breeding habitat. These areas of habitat are within or immediately adjacent to the land required for the construction of the Proposed Scheme. Woodland and scrub along either side

of the Padbury Brook south of Home Farm, Twyford was considered to offer low potential to provide otter terrestrial breeding habitat as it was open and sparse and did not provide cover that would conceal a holt.

3.4.29 The majority of the Padbury Brook catchment could be accessed. Evidence of otter was found in four locations in this area although there were no active or potential otter holts identified (distances are all relative to the land required for the construction of the Proposed Scheme):

- an otter spraint was found at a watercourse which flows in from the eastern side of Calvert Jubilee Lake and is in the extent of the land required for the construction of the Proposed Scheme (SP684251);
- at Grebe Lake a potential lying-up site (SP675253) was recorded approximately 50m north-west and potential feeding remains (SP674249) recorded 640m north-east. Otter tracks and footprints were found at 495m north (SP675248) and 410m north respectively (SP674249);
- on the Padbury Brook between Three Bridge Mill and Twyford, three spraints were found (SP670270, 164m north-east, SP670269 143m south-west and SP670270 163m south-west). Feeding remains (SP669277, 141m south-west and SP670269, 143m south-west), otter prints and tracks (SP670270, 163m south-west) and two potential lying-up sites for otter (SP670269, 143m south-west and SP670270, 163m south-west) were also found. A potential holt (SP667266) was recorded along this stretch and was within land required for the construction of the Proposed Scheme; and
- along the Padbury Brook between Twyford Mill and Goddington, a cumulative total of eighteen spraints were found across all the surveys (SP650279 95m north-east, SP649278 190m north-east, SP647276 480m north-east and SP648273 545m north-east). Otter footprints and tracks were also found (SP647276 480m north-east and SP648273 546m north-east respectively).

3.4.30 Following habitat suitability appraisals nine ditches and three ponds were scoped out of further survey. The ditches were narrow, either shallow or dry and poorly connected to other watercourses. The ponds were surrounded by amenity or improved grassland with low levels of cover. Some areas of the Padbury Brook catchment could not be accessed; these included the northern bank upstream of Three Bridge Mill and the eastern bank at Preston Bassett. Grebe Lake and Calvert Jubilee Lake were accessed, but the pond to the south of School Lane could not be surveyed due to access restrictions.

3.4.31 Desk study records yielded five records for otter in this area. One record was located along the Padbury Brook just north of Three Bridge Mill in 2012 0.45km north-east of the land required for the construction of the Proposed Scheme. Another individual record along the Padbury Brook is located just south-west of Padbury in 2008 3.28km north-east of the land required for the construction of the Proposed Scheme. The remaining three records were all located south-east of Water Stratford along the River Great Ouse from between 2008 to 2012 at 2.97km and 3.74km north-east of the land required for the construction of the Proposed Scheme.

3.4.32 Field study data indicates that otters are present along the Padbury Brook including all areas in the extent of the land required for the construction of the Proposed Scheme. A number of spraints were recorded on a number of different occasions, indicating that otters use this watercourse frequently. No evidence of movement of individual otters was noted but otters on the Padbury Brook may range as far as Grebe Lake, Calvert Jubilee Lake and Finmere Woods for foraging and to find shelter.

### **CFA14 Newton Purcell to Brackley**

3.4.33 Suitable otter habitat in the Newton Purcell to Brackley area (CFA14) includes the River Great Ouse that passes twice through the extent of the land required for the construction of the Proposed Scheme, to the west of Westbury and to the north-east of Brackley. In addition, a number of tributaries of the River Great Ouse also cross the land required for the construction of the Proposed Scheme. There are also a number of water bodies at Finmere Quarry located within 100m of the land required for the construction of the Proposed Scheme.

#### *The River Great Ouse Catchment*

3.4.34 Access for field surveys was granted along the majority of the River Great Ouse. Suitable habitat for otter was present along a stretch of the river approximately 2.4km in length to the west of Westbury, and along the watercourse to the north-east of Brackley. No active or potential holts were confirmed during surveys of these areas.

3.4.35 Field surveys recorded evidence of otter at the following locations (distances and orientation are all relative to the land required for the construction of the Proposed Scheme):

- along a stretch of the River Great Ouse between Westbury Mill and Fulwell: six spraints were found during one visit 580m west (SP622352); 20 spraints were found during one visit 380m west (SP620354). Possible feeding remains were found 655m west (SP623351) and two potential holts were found (225m west (SP618353), and 0.2km south-west (SP618353)).
- along the River Great Ouse, east of Brackley, one otter spraint was found where the A43 crosses the river at approximately 998m (SP595373);
- one otter spraint was found near Mixbury where the Evenly Road crosses an unnamed stream which flows through Mossy Corner Spinney. This location is approximately 374m upstream (SP608343); and
- south-east of Radstone is a large lake and unnamed stream which flows into the River Great Ouse. No evidence of otters was found during surveys at this lake, but otter spraints were found further east, at Hoppersford Bridge which is approximately 1.8km downstream (SP611404). A single spraint was found at the same location on two occasions (SP582416) approximately 119m south-west of the land required for the construction of the Proposed Scheme along an unnamed stream to the east of Halse Copse, and a potential holt site (SP579414) was found approximately 30m downstream from this spraint location (this location is also referred to in CFA15 as it is on the boundary between the two CFAs).

3.4.36 Terrestrial breeding habitat along the disused railway near Westbury was considered suitable for otter but was not accessible for survey. There are two streams located to the south-east of Radstone which flow into the River Great Ouse. These were scoped out of further survey following the habitat suitability appraisal as they were shallow, narrow streams, with little available cover. No other watercourses or water bodies were scoped out following the habitat suitability appraisal. Access for field surveys was granted along the majority of the River Great Ouse with the exception of the area to the north of Turweston and the area to the south of the A421.

3.4.37 Desk study records for otter include the following (in each case the type of evidence found was not provided); (distances are all relative to the land required for the construction of the Proposed Scheme):

- on a tributary of the River Great Ouse near Brackley in 2000 at grid reference SP563380, at approximately 3 km;
- on a tributary of the River Great Ouse near Radstone in 2000 at grid reference SP601403, at approximately 900m;
- at Syresham Pocket Park close to the River Great Ouse in 2006 at grid reference SP638414, at approximately 4.7km; and
- at Kings Hill Bridge, Syresham in 2006 at grid reference SP638414, at approximately 4.8km.

3.4.38 Given the wide distribution of otter spraiting, and the number of separate occasions on which spraint has been found, it is assumed that otters are present along all areas of the River Great Ouse within the land required for the construction of the Proposed Scheme. It is likely that otter also make use of tributary streams feeding the Great Ouse, which are in the extent of the land required for the construction of the Proposed Scheme, for foraging and as corridors for movement, with associated areas of woodland cover providing potential terrestrial breeding habitat.

#### *Finmere Quarry*

3.4.39 Full access was obtained to land required for survey at Finmere Quarry. No watercourses/water bodies were scoped out of further survey. No active or potential holts were confirmed and no evidence of otter was recorded from field surveys at this site.

3.4.40 No desk study records were provided for Finmere Quarry.

#### **CFA15 Greatworth to Lower Boddington**

3.4.41 The following watercourses provide suitable otter habitat in the Greatworth to Lower Boddington area (CFA15):

- two unnamed streams at the southern end of this area, close to Halse Copse, which converge and ultimately flow into the River Great Ouse. Highly suitable terrestrial breeding habitat was found at Halse Copse;
- the River Cherwell and the network of streams, lakes and ponds, which flow into it. In the areas where access was allowed, woodland areas adjacent to the

streams, lakes and ponds were classified as providing moderate cover and moderate to high food supply. This resulted in the assessment that terrestrial breeding habitat of moderate to high suitability to support otter exists in and around Lower Thorpe Farm, Culworth Grounds Farm and Osierbed Spinney;

- the Highfurlong Brook which is located in between Aston Le Walls and Lower Boddington ; and
- the Boddington Feeder Canal.

### *The River Great Ouse Catchment*

3.4.42 Full access was possible to the northern bank of the stretch of the River Great Ouse required for survey within the area. The streams at Greatworth, which ultimately flow into the River Great Ouse, were scoped out of further survey following the habitat suitability appraisal as they were shallow, narrow streams, with little available cover, flowing through an agricultural landscape of arable and pasture fields.

3.4.43 Surveys recorded a single spraint on two occasions (SP582416) approximately 120m south-west of the land required for the construction of the Proposed Scheme along an unnamed stream to the east of Halse Copse. A potential holt site (SP579414) was found approximately 30m downstream from the spraint location (as mentioned in CFA14).

3.4.44 No desk study records were provided for the River Great Ouse within this area.

### *The River Cherwell Catchment*

3.4.45 Access to the River Cherwell was heavily constrained; however, field surveys were undertaken along the western banks of the river west of Culworth Mill. North of Chipping Warden, a ditch and pond were scoped out of further survey following the habitat suitability appraisal. The ditch was found to be dry and the pond was found to be too small and isolated to be suitable for otters.

3.4.46 The following otter evidence was recorded (distances are all relative to the land required for the construction of the Proposed Scheme):

- a confirmed holt site at Culworth Grounds Farm (SP535457, 106m south-west);
- spraints (SP534458 75m south-west, SP535460 108m north-west, SP516479 within the land required for the construction of the Proposed Scheme);
- anal jelly (SP534458 95m south-west);
- tracks/footprints (SP537453 95m south-west, SP537463 380m south-west, SP537453 within the land required for the construction of the Proposed Scheme);
- feeding remains (SP537463 346m south-west);
- a lying up sites (SP514483 and SP516479, both within the land required for the construction of the Proposed Scheme); and
- potential holt (SP537452 within the land required for the construction of the

Proposed Scheme).

3.4.47 No desk study records were provided for the River Cherwell within this area

#### *Highfurlong Brook*

3.4.48 Access to the majority of the Highfurlong Brook was not granted. However, field surveys were carried out of a small stretch of river north of Appletree where habitat was found to be suitable.

3.4.49 Field surveys recorded evidence of otter at the following locations:

- otter spraint approximately 470m to the south-west of land required for the construction of the Proposed Scheme (SP480506); and
- potential lying-up site approximately 470m to the south-west of land required for the construction of the Proposed Scheme (SP480506)

3.4.50 No desk study records were provided for the Highfurlong Brook within this area.

#### *Oxford Canal*

3.4.51 Access was obtained to the majority of land for the Oxford Canal and canal feeders. One small channel to the west of Boddington Road was scoped out of further survey following the habitat suitability appraisal as it was narrow and shallow with little cover, flowing through arable and pasture fields. Field surveys recorded evidence of otter at the following locations (distances are all relative to the land required for the construction of the Proposed Scheme):

- along the canal feeder which flows from Boddington Reservoir to the Oxford Canal to the south of Lower Boddington, spraints and prints were found approximately 57m south-west (incidental records i.e. not during a specific otter survey);
- three potential lying up sites were found to the north-west of Lower Boddington within the land required for the construction of the Proposed Scheme area (SP471524, SP471524 and SP471524); and
- otter spraints and anal jelly were found at Hay Bridge which crosses the Oxford Canal at approximately 1km (SP460511, SP460511 and SP460511).

3.4.52 Desk study records for otter include an otter spraint along the Oxford Canal at Cropredy in 2010 at grid references SP469459 and SP469459, at approximately 4.7km.

3.4.53 Otter have been confirmed on all river catchments in this area. It is assumed that this species would use all watercourses and water bodies, as all were considered to have suitable habitat for foraging and as movement routes. A single otter holt was identified in the River Cherwell catchment. It is possible that this holt may be used for breeding.

# 4 Water vole

## 4.1 Introduction

4.1.1 This section of the appendix presents details of baseline information relating to water vole (*Arvicola amphibius*) for the section of the Proposed Scheme that will pass through CFA7 to 15 inclusive.

## 4.2 Methodology

4.2.1 Desk study records relating to water vole within 5km of the land required for construction of the Proposed Scheme were obtained from the following sources:

- Bedfordshire, Cambridgeshire and Northamptonshire Wildlife Trust;
- Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT);
- The Buckinghamshire and Milton Keynes Environmental Records Centre (BMERC);
- Greenspace Information for Greater London (GIGL);
- Hertfordshire Biological Records Centre;
- Northamptonshire Biodiversity Records Centre (NBRC);
- Northamptonshire County Council;
- Oxfordshire County Council; and
- Thames Valley Environmental Records Centre (TVERC).

4.2.2 Details of the standard methodology utilised for water vole are provided in the Technical Note HS2 Ecological Surveys: Field Survey Methods and Standards, which is included as an appendix to Volume 1.

4.2.3 Table 90 provides a summary of watercourses and water bodies subject to survey for water voles. For each water body/watercourse a habitat suitability appraisal was carried out and, where suitable habitat was identified, more detailed field surveys were undertaken to establish presence/ likely absence. For all survey sites where the habitat suitability appraisal was undertaken between April and September, detailed surveys were carried out at the same time.

4.2.4 During the initial habitat suitability appraisal, poor quality habitats considered unsuitable to support water vole were scoped out. Factors that would result in a watercourse being scoped out included high levels of shading, poor food availability, poor connectivity and/or lack of suitable banks for burrowing. Examples of these included: watercourses/water bodies being tree-lined, resulting in a lack of water-margin vegetation; heavily managed watercourses/water bodies with limited vegetation cover; high levels of disturbance; watercourses drying out, resulting in poor food availability; and/canalised watercourses resulting in lack of burrowing

substrate. A summary of sites which were scoped in for detailed survey is included in Table 90.

4.2.5 Best practice survey guidance<sup>41</sup> states that water vole presence can only be confirmed if several field signs of this species are recorded in association with one another. During field surveys, mammal burrows, mammal feeding remains and other field signs were only regarded as evidence of water vole if found in association with water vole droppings.

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<sup>41</sup> Strachan, R., Moorhouse, T and Merry Gelling (2011), *The water vole conservation handbook - 3rd Edition*. Wild Cru. Oxford.

Table 90: Summary of features subject to water vole survey

<b>Watercourse or water body name (In all rows river catchment will be stated first followed by site name)</b>	<b>Feature type</b>	<b>OS grid reference (Start and Finish)</b>	<b>Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (&gt;25%) /none (0%)</b>	<b>Ecology survey code</b>	<b>Survey dates</b>	<b>CFA No.</b>	<b>Distance from land required for construction of the Proposed Scheme (m) and orientation</b>
River Colne (Broadwater Lake) - Land and buildings at Broadwater Park	Lake	TQ043884	Majority	020-WV1-027001	28-Nov-12	7	Within land required for construction of the Proposed Scheme
River Colne - Long Pond Lake	Lake	TQ042888	Moderate	020-WV1-027002	17 May 2012, 18 May 2012, 10 October 2012, 21 May 2013, 24 May 2013	7	Within land required for construction of the Proposed Scheme
River Colne - Korda Lake	Lake	TQ045886	Moderate	020-WV1-027003	17 May 2012 18 May 2012, 10 October 2012, 21 May 2013, 24 May 2013	7	Within land required for construction of the Proposed Scheme
River Colne - Tilehouse South Lake	Lake	TQ039895	Moderate	020-WV1-027004	17 May 2012, 18 May 2012, 10 October 2012, 21 May 2013, 24 May 2013	7	Within land required for construction of the Proposed Scheme
River Colne - Bluewater Lake	Lake	TQ043892	Moderate	020-WV1-027005	17 May 2012, 18 May 2012, 10 October 2012, 21 May 2013, 24 May 2013	7	Within land required for construction of the Proposed Scheme
River Colne	River	TQ044883 to TQ039900	Moderate	020-WV1-027006	17 May 2012, 18 May 2012, 10 October 2012, 21 May 2013, 24 May 2013	7	Within land required for construction of the Proposed Scheme
River Colne - land lying to the north-east side of Link Way, Denham	River	TQ042882	Moderate	020-WV1-027007	17 May 2012, 18 May 2012, 10 October 2012, 21 May 2013, 24	7	165m(north-east)

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Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
					May 2013		
River Misbourne - The Stone, Pheasant Hill, Chalfont St Giles	River	SU991937 to SU991937	Majority	020-WV1-035001	14 May 2013	8	Within land required for construction of the Proposed Scheme
River Misbourne - Land at Shardeloes Lake	River	SP940981 to SP934984	Majority	020-WV1-041001	27 June 2013	8	Within land required for construction of the Proposed Scheme
Shardeloes Lake	Lake	SP942980	Majority	020-WV1-042002	27 June 2013	8	Within land required for the construction of the Proposed Scheme
River Thame (Stoke Brook) - the orchard, Nash Lee Road, Terrick, Ellesborough	Stream	SP844091 to SP846093	Moderate	020-WV1-056001	6 June 2013	10	Within land required for construction of the Proposed Scheme
Land at Whitethorn Farm, Old Risborough Road, Stoke Mandeville, Buckinghamshire HP22 5XJ	Stream	SP834097 to SP832099	Majority	020-WV1-057003	7 May 2013	11	Within land required for construction of the Proposed Scheme
River Thame (Bear Brook) - Aylesbury Park Golf Course	Pond	SP800126	Full	020-WV1-062001	5 June 2013, 8 May 2013	11	28m (south-west)
River Thame (Bear Brook) - Aylesbury Park Golf Course	Pond	SP800130 to SP800130	Full	020-WV1-062002	5 June 2013, 8 May 2013	11	175m (south-west by west)
River Thame (Bear Brook) - Aylesbury Park Golf Course	Ditch	SP799134	Full	020-WV1-062003	5 June 2013, 8 May 2013	11	104m (south-east)
River Thame (Bear Brook) - Aylesbury Park Golf Course	Ditch	SP799133 to SP797128	Moderate	020-WV1-062004	5 June 2013, 8 May 2013	11	Within land required for construction of the Proposed Scheme

Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
River Thame (Bear Brook) - Aylesbury Park Golf Course	Pond	SP797131	Full	020-WV1-063001	5 June 2013, 8 May 2013	11	306m (south-west)
River Thame (Bear Brook) - Aylesbury Park Golf Course	Pond	SP798133	Majority	020-WV1-063002	5 June 2013, 8 May 2013	11	69m (south-east)
River Thame (Bear Brook) - Aylesbury Park Golf Course	Pond	SP798134	Majority	020-WV1-063004	5 June 2013, 8 May 2013	11	165m (south-east)
River Thame (Bear Brook) - Aylesbury Park Golf Course	Pond	SP797135	Full	020-WV1-063005	5 June 2013, 8 May 2013	11	Within land required for construction of the Proposed Scheme
River Thame (Bear Brook) - Aylesbury Park Golf Course	Pond	SP795135	Little	020-WV1-063006	5 June 2013, 8 May 2013	11	98m (south-west)
River Thame (Bear Brook) - Aylesbury Park Golf Course	Pond	SP792135	Majority	020-WV1-063007	5 June 2013, 8 May 2013	11	Within land required for construction of the Proposed Scheme
River Thame (Bear Brook) - Aylesbury Park Golf Course	Pond	SP791139	Majority	020-WV1-063008	5 June 2013, 8 May 2013	11	15m (east)
River Thame (Stoke Brook) - Land on the North of Old Risborough Road, Stoke Mandeville	Stream	SP834097 to SP834097	Moderate	020-WV1-057002	7 May 2013	11	23m (south-west)
River Thame (Stoke Brook) - Land & buildings adjoining Stoke House, Risborough Road, Stoke Mandeville	Stream	SP839094 to SP835096	Moderate	020-WV1-057001	2 May 2012, 12 June 2012, 26 June 2012	11	Within land required for construction of the Proposed Scheme
River Thame (Stoke Brook) - Land & buildings adjoining Stoke House, Risborough Road, Stoke Mandeville	Stream	SP839093 to SP842091	Moderate	020-WV1-057006	2 May 2012, 12 June 2012, 26 June 2012	11	Within land required for construction of the Proposed Scheme

Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
River Thame (Stoke Brook) - Land lying to the North-east of Standalls Farm, Stoke Mandeville	Stream	SP815110 to SP818108	Moderate	020-WV1-058001	6 June 2013, 7 May 2013	11	Within land required for construction of the Proposed Scheme
River Thame (Sedrup Ditch) - Land on the south-east of Anton Way, Aylesbury	Stream	SP815110	Moderate	020-WV1-060001	14 May 2013, 6 June 2013	11	No water on site
River Thame (Stoke Brook) - Land at Stoke Farm, Stoke Mandeville	Stream	SP821107 to SP817109	Moderate	020-WV1-059001	27 June 2013	11	Within land required for construction of the Proposed Scheme
Large Lake - D10 (Hartwell House Hotel)	Lake	SP796126 to SP796126	Moderate	020-WV1-062005	6 June 2013	11	194m (east)
Ditch - D10 (Hartwell House Hotel)	Ditch	SP795127 to SP795127	Majority	020-WV1-062006	6 June 2013	11	118m (north-east)
D10 (Hartwell House Hotel)	Area of wet woodland	SP797128 to SP797126	Moderate	020-WV1-062007	6 June 2013	11	Within land required for construction of the Proposed Scheme
D10 (Hartwell House Hotel)	Pond	SP796123 to SP796123	Full	020-WV1-062008	6 June 2013	11	195m (south-east)
River Thame (Sedrup Ditch) Land to the south-west of Lower Road, Stoke Mandeville	Stream	SP825105 to SP826104	Moderate	020-WV1-057005	7 May 2013	11	Within land required for construction of the Proposed Scheme
River Thame (Bear Brook) Putlowes Farm, Fleet Marston, Aylesbury	Stream	SP784145 to SP783144	Full	020-WV1-064001	27 June 2012, 29 June 2012, 8 October 2012, 3 May 2013	11	Within land required for construction of the Proposed Scheme
River Thame (Bear Brook) - Putlowes	Stream	SP783149 to	Full	020-WV1-	27 June 2012, 29 June 2012, 8 October 2012,	11	Within land required for construction of the Proposed

Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
Farm, Fleet Marston, Aylesbury		SP784145		064002	23 May 2013		Scheme
River Thame (Stoke Brook) - Land at Yew Tree Farm, Stoke Mandeville	Stream	SP828103 to SP832100	Moderate	020-WV1-058002	27 June 2013	11	Within land required for construction of the Proposed Scheme
River Thame (Stoke Brook) - Land at Yew Tree Farm, Stoke Mandeville	Stream	SP836098 to SP840099	Moderate	020-WV1-057004	27 June 2013	11	30m (south-west)
River Ray - Land at Finemere Wood, Quainton	River	SP718216 to SP717221	Majority	020-WV1-074005	26 June 2013	12	291m (south-west)
River Ray - Oaktree Farm, Quainton, Aylesbury	River	SP709216 to SP710215	Full	020-WV1-075003	25 June 2013	12	Within land required for construction of the Proposed Scheme
River Ray - Land at Woodlands Farm, Edgcott Road, Doddershall (BBOWT)	River	SP718213 to SP711210	Moderate	020-WV1-074001	19 June 2013	12	211m (south-west)
River Ray (Muxwell Brook) Calvert Waste Terminal (Woods) C	Stream	SP702228 to SP699225	Full	020-WV1-076001	25 March 2013	12	Within land required for construction of the Proposed Scheme
River ray (Muxwell Brook) - Tennant Woods	Ditch	SP703217 to SP706221	Full	020-WV1-075001	25 March 2013	12	23m (north)
Padbury Brook - Barton Grounds Farm, Newton Purcell	River	SP628298 to SP632304	Full	020-WV1-086011	30 January 2013	13	Within land required for construction of the Proposed Scheme
Padbury Brook - Barton Grounds Farm, Newton Purcell	River	SP631302 to SP632303	Full	020-WV1-086006	30 January 2013	13	Within land required for construction of the Proposed Scheme

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Ditch - Barton Grounds Farm, Newton Purcell	Ditch	SP626295 to SP627294	Full, Poor	020-WV1-086001	7 May 2013	13	665m (north-east)
Ditch - Barton Grounds Farm, Newton Purcell	Ditch	SP627294 to SP628297	Full	020-WV1-086002	7 May 2013	13	353m (north-east)
Stream/Ditch - Barton Grounds Farm, Newton Purcell	Stream/Ditch	SP627298 to SP626295	Full	020-WV1-086003	7 May 2013	13	380m (north-east)
Stream/Ditch - Barton Grounds Farm, Newton Purcell	Stream/Ditch	SP628297 to SP629298	Full	020-WV1-086004	7 May 2013	13	353m (north-east)
Stream/Ditch - Barton Grounds Farm, Newton Purcell	Stream/Ditch	SP626299 to SP626298	Full	020-WV1-086005	7 May 2013	13	366m (north-east)
Padbury Brook - Barton Grounds Farm, Newton Purcell	Stream	SP630300 to SP630301	Full	020-WV1-086007	7 May 2013	13	Within land required for construction of the Proposed Scheme
Stream/Ditch - Barton Grounds Farm, Newton Purcell	Stream/Ditch	SP630301 to SP632303	Full	020-WV1-086008	7 May 2013	13	Within land required for construction of the Proposed Scheme
Pond - Barton Grounds Farm, Newton Purcell	Pond	SP631302	Full, Moderate	020-WV1-086009	7 May 2013	13	10m (north-east)
Pond - Barton Grounds Farm, Newton Purcell	Pond	SP630304	Full	020-WV1-086010	7 May 2013	13	Within land required for construction of the Proposed Scheme
Padbury Brook - Land at Twyford and Steeple Claydon, Buckingham	Drain	SP685252 to SP684251	Moderate	020-WV1-079002	2 May 2013	13	Within land required for construction of the Proposed Scheme

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Calvert landfill [Calvert Jubilee LNR]	Drain	SP684249	Full	020-WV1-080001	8 October 2012	13	Within land required for construction of the Proposed Scheme
Grebe Lake - Land on the north side of School Hill, Charndon (Grebe Lake)	Lake	SP680252	Full	020-WV1-079001	30 May 2013	13	61m (east)
Padbury Brook - Home Farm House, Main Street, Twyford, Buckinghamshire	Stream	SP664262 to SP671262	Majority	020-WV1-081001	12 June 2013	13	116m (north-east)
Pond - Home Farm House, Main Street, Twyford, Buckinghamshire	Pond	SP667264	Majority	020-WV1-081002	12 June 2013	13	115m (north-east)
Pond - Home Farm House, Main Street, Twyford, Buckinghamshire	Pond	SP669263	Majority	020-WV1-081003	12 June 2013	13	194m (north-east)
Padbury Brook - Home Farm House, Main Street, Twyford, Buckinghamshire	Stream	SP667264 to SP671267	Majority	020-WV1-081004	12 June 2013	13	Within land required for construction of the Proposed Scheme
Pond - Home Farm House, Main Street, Twyford, Buckinghamshire	Pond	SP667266	Majority	020-WV1-081005	12 June 2013	13	23m (north-east)
Pond - Home Farm House, Main Street, Twyford, Buckinghamshire	Pond	SP671266	Majority	020-WV1-081006	12 June 2013	13	Within land required for construction of the Proposed Scheme
Pond - Home Farm House, Main Street, Twyford, Buckinghamshire	Pond	SP670267	Majority	020-WV1-081007	12 June 2013	13	48m (south-west)
Padbury Brook - Home Farm House, Main Street, Twyford, Buckinghamshire	Stream	SP671267 to SP672268	Majority	020-WV1-081008	12 June 2013	13	110m (south-west)

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Padbury Brook - Home Farm House, Main Street, Twyford, Buckinghamshire	Stream	SP672268 to SP667270	Majority	020-WV1-081009	12 June 2013	13	8m (east)
Padbury Brook - Home Farm House, Main Street, Twyford, Buckinghamshire	Stream	SP667270 to SP667269	Majority	020-WV1-081010	12 June 2013	13	Within land required for construction of the Proposed Scheme
Pond - Land at Home Farm, Barton Hartshorn	Pond	SP637312	Majority	020-WV1-087001	26 June 2013	13	620m (south-west)
Padbury Brook - Land at Home Farm, Barton Hartshorn	Ditch	SP638312 to SP639312	Majority	020-WV1-087002	26 June 2013	13	672m (south-west)
Padbury Brook - Land at Home Farm, Barton Hartshorn	Ditch	SP639312 to SP638310	Majority	020-WV1-087003	26 June 2013	13	506m (south-west)
Padbury Brook - Land at Home Farm, Barton Hartshorn	Stream	SP632310 to SP632305	Majority	020-WV1-087004	26 June 2013	13	Within land required for construction of the Proposed Scheme
Padbury Brook - Shepherds Furze Farm, Steeple Claydon	Stream	SP689257 to SP685253	Full	020-WV1-079003	28 June 2013	13	Within land required for construction of the Proposed Scheme
Drain - Stone Court Farm, West Street, Steeple Claydon	Drain	SP683265 to SP686264	Full	020-WV1-080005	29 May 2013	13	Within land required for construction of the Proposed Scheme
Padbury Brook - Portway Farm, Twyford, Buckingham	Stream	SP667263 to SP677255	Full	020-WV1-080002	28 June 2013	13	Within land required for construction of the Proposed Scheme
Padbury Brook - Portway Farm,	Stream	SP670257 to	Full	020-WV1-	28 June 2013	13	170m (east)

Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
Twyford, Buckingham		SP671259		080003			
Padbury Brook - Portway Farm, Twyford, Buckingham	Stream	SP670257 to SP670253	Full	020-WV1-080004	28 June 2013	13	135m (north-east)
Pond - The Hermitage, Chetwode	Pond	SP639295 to SP639295	Full	020-WV1-086012	30 January 2013	13	Within land required for construction of the Proposed Scheme
Moat - The Hermitage, Chetwode	Moat	SP638296 to SP639296	Full	020-WV1-086013	30 January 2013	13	9m (north-west)
Pond - The Hermitage, Chetwode	Pond	SP638296 to SP638296	Full	020-WV1-086014	30 January 2013	13	Within land required for construction of the Proposed Scheme
Padbury Brook - Unregistered land known as Cowley Farm	Stream	SP662275 to SP663271	Moderate	020-WV1-083001	24 June 2013	13	Within land required for construction of the Proposed Scheme
Padbury Brook - Church View Farm, Church St, Twyford, Buckingham	Stream	SP661267 to SP656269	Moderate	020-WV1-082006	27 July 2013	13	132m (north)
Padbury Brook - Church View Farm, Church St, Twyford, Buckingham	Stream	SP664269 to SP657271	Moderate	020-WV1-082007	27 July 2013	13	Within land required for construction of the Proposed Scheme
River Great Ouse - Land at the back of Turweston Lodge, Main Street, Turweston	River	SP599379 to SP599379	Moderate	020-WV1-095001	4 June 2013	14	195m (north-east)
River Great Ouse - Halse Grange Farm, Halse	River	SP578418 to SP582416	Moderate	020-WV1-099001	12 June 2013	14	83m (south-east)

Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
River Great Ouse - Halse Grange Farm, Halse	River	SP582415 to SP575411	Moderate	020-WV1-099002	12 June 2013	14	Within land required for construction of the Proposed Scheme
Lake - Cold Harbour Farm, Radstone, Brackley, Northamptonshire,	Lake	SP600404	Full	020-WV1-097001	25 June 2013	14	974m (south-west)
River Great Ouse - Cold Harbour Farm, Radstone, Brackley, Northamptonshire,	River	SP600404 to SP596408	Full	020-WV1-097002	25 June 2013	14	856m (south-west)
River Great Ouse - Cold Harbour Farm, Radstone, Brackley, Northamptonshire,	River	SP598405 to SP590402	Full.	020-WV1-097003	25 June 2013	14	Within land required for construction of the Proposed Scheme
Ditch - Land on the West side of the road leading from Brackley to Helmdon, Radstone	Dry Ditch	SP584409 to SP579408	Full	020-WV1-098002	10 June 2013	14	Within land required for construction of the Proposed Scheme
Ditch - Land on the West side of the road leading from Brackley to Helmdon, Radstone	Dry Ditch	SP585392 to SP584394	Full	020-WV1-097004	10 June 2013	14	21m (west)
Ditch - Land on the West side of the road leading from Brackley to Helmdon, Radstone	Dry Ditch	SP586401 to SP580399	Full	020-WV1-098001	10 June 2013	14	Within land required for construction of the Proposed Scheme
Great River Ouse - Glebe Farm, Mixbury, Brackley	Drain	SP611343 to SP613343	Full	020-WV1-091003	7 May 2013	14	19m (north-east)
Small Lake - Finmere Quarry	Lake	SP624326	Full	020-WV1-089010	24 June 2013	14	22m (north)
Pond - Finmere Quarry	Pond	SP625324	Full	020-WV1-	24 June 2013	14	18m (south-west)

Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
				089001			
Lake - Finmere Quarry	Lake	SP626322	Full	020-WV1-089002	24 June 2013	14	8m (south-west)
Pond - Finmere Quarry	Pond	SP627321	Full	020-WV1-089003	24 June 2013	14	64m (south-west)
Pond - Finmere Quarry	Pond	SP627321	Full	020-WV1-089004	24 June 2013	14	98m (south-west)
Pond - Finmere Quarry	Pond	SP627323	Full	020-WV1-089005	24 June 2013	14	192m (south-west)
Pond - Finmere Quarry	Pond	SP627323	Full	020-WV1-089006	24 June 2013	14	193m (south-west)
Lake - Finmere Quarry	Lake	SP629323	Full	020-WV1-089007	24 June 2013	14	333m (south-west)
Pond - Finmere Quarry	Pond	SP629321	Full	020-WV1-089008	24 June 2013	14	273m (south-west)
Pond - Finmere Quarry	Pond	SP629321	Full	020-WV1-089009	24 June 2013	14	269m (south-west)
Lake - Land at Westbury, Brackley	Lake	SP622351	Full	020-WV1-091001	25 June 2013	14	753m (south-west)
River Great Ouse - Land at Westbury, Brackley	River	SP623350 to SP616352	Moderate	020-WV1-090002	25 June 2013	14	25m (west)
River Great Ouse - Greatworth Hall Farm, Helmdon Road, Greatworth,	Stream	SP559426 to SP558425	Full	020-WV1-101001	31 June 2013	15	Within land required for construction of the Proposed

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Northamptonshire							Scheme
Ditch - Greatworth Hall Farm, Helmdon Road, Greatworth, Northamptonshire	Ditch	SP572435 to SP569432	Full	020-WV1-101005	8 May 2013	15	Within land required for construction of the Proposed Scheme
Ditch - Greatworth Hall Farm, Helmdon Road, Greatworth, Northamptonshire	Ditch	SP573437 to SP573436	Full	020-WV1-101002	8 May 2013	15	960m (south-west)
Ditch - Greatworth Hall Farm, Helmdon Road, Greatworth, Northamptonshire	Ditch	SP568435 to SP572437	Full	020-WV1-101003	8 May 2013	15	745m (south-west)
Ditch - Greatworth Hall Farm, Helmdon Road, Greatworth, Northamptonshire	Ditch	SP565434 to SP566435	Full	020-WV1-101004	8 May 2013	15	455m (south-west)
Ditch - Redhill Farm, Banbury Road, Chipping Warden, Daventry	Dry Ditch	SP502500 to SP504497	Full	020-WV1-110001	27 June 2013	15	335m (south-west)
Pond - Redhill Farm, Banbury Road, Chipping Warden, Daventry	Pond	SP502500	Full	020-WV1-110002	27 June 2013	15	2025m (south-west)
Pond - Thorpe Mandeville Court, Thorpe Mandeville, Banbury	Pond	SP535448	Full	020-WV1-104001	28 May 2013	15	194m (east)
Pond - Thorpe Mandeville Court, Thorpe Mandeville, Banbury	Pond	SP535448 to SP535486	Full	020-WV1-104002	28 May 2013	15	236m (east)
Pond - Thorpe Mandeville Court, Thorpe Mandeville, Banbury	Pond	SP5348944855	Full	020-WV1-104003	28 May 2013	15	300m (east)
Pond - Thorpe Mandeville Court,	Pond	SP5324244831	Full	020-WV1-	28 May 2013	15	552m (east)

Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
Thorpe Mandeville, Banbury				104004			
Stream - Thorpe Mandeville Court, Thorpe Mandeville, Banbury	Stream	SP534448 to SP533447	Full	020-WV1-104005	28 May 2013	15	326m (east)
River Cherwell - Land on the west side of Banbury Lane, Thorpe Mandeville, Banbury	River	SP535455 to SP532458	Full	020-WV1-105005	30 January 2013	15	Within land required for construction of the Proposed Scheme
River Cherwell - Land at Culworth	River	SP524480 to SP522479	Moderate	020-WV1-108001	14 June 2013	15	Within land required for construction of the Proposed Scheme
Pond -Manor Farm, Aston Le Walls	Pond	SP493509	Moderate	020-WV1-112001	16 May 2013	15	557m (south-west)
Pond -Manor Farm, Aston Le Walls	Pond	SP493509	Moderate	020-WV1-112002	16 May 2013	15	528m (south-west)
Pond -Manor Farm, Aston Le Walls	Pond	SP494509	Moderate	020-WV1-112003	16 May 2013	15	526m (south-west)
Pond -Manor Farm, Aston Le Walls	Pond	SP489507	Moderate	020-WV1-112004	16 May 2013	15	78m (south-west)
Pond -Manor Farm, Aston Le Walls	Pond	SP491508	Moderate	020-WV1-112005	16 May 2013	15	246m (south-west)
Pond -Manor Farm, Aston Le Walls	Pond	SP493509	Moderate	020-WV1-112002	16 May 2013	15	528m (south-west)
Pond -Manor Farm, Aston Le	Pond	SP490508	Moderate	020-WV1-112006	16 May 2013	15	180m (south-west)

Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
River Cherwell - Land at Culworth Trafford Bridge Marsh	River	SP518478 to SP516479	Moderate	020-WV1-108002	14 June 2013	15	Within land required for construction of the Proposed Scheme
Pond - Culworth Grounds Farm, Thorpe Mandeville	Pond	SP538460	Moderate	020-WV1-105001	26 June 2013	15	344m(west)
Pond - Culworth Grounds Farm, Thorpe Mandeville	Pond	SP531458	Moderate	020-WV1-105002	26 June 2013	15	Within land required for construction of the Proposed Scheme
Stream - Culworth Grounds Farm, Thorpe Mandeville	Stream	SP532458 to SP534460	Moderate	020-WV1-105003	26 June 2013	15	Within land required for construction of the Proposed Scheme
River Cherwell - Culworth Grounds Farm, Thorpe Mandeville	River	SP534460 to SP534472	Moderate	020-WV1-105004	26 June 2013	15	Within land required for construction of the Proposed Scheme
Stream - Land at Floyds Farm, Greatworth	Stream	SP556423 to SP554420	Moderate	020-WV1-101006	15 May 2013	15	212m (north-east) & 278m (north-east)
Canal Feeder - Manor Farm, Banbury Road, Lower Boddington, Daventry	Canal	SP483517 to SP482517	Full	020-WV1-113003	28 June 2013	15	55m (south-west)
Canal Feeder - Old House Farm, Banbury Road, Lower Boddington, Daventry	Canal	SP479519 to SP481518	Moderate	020-WV1-113001	27 June 2013	15	4.75m (south-west)
Highfurlong Brook - Old House Farm, Banbury Road, Lower Boddington, Daventry	Stream	SP481507 to SP480505	Moderate	020-WV1-113002	27 June 2013	15	43m (north-east)
Canal Feeder - Old House Farm, Banbury Road, Lower Boddington,	Canal	SP479519 to	Moderate	020-WV1-	27 June 2013	15	11m (south-west)

Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
Daventry		SP481518		113005			
Springfield Farm, Lower Boddington	Canal	SP460511 to SP464506	Moderate	020-WV1-114001	28 June 2013	15	1365m (north-east)
Claydon Brook - Springfield Farm, Lower Boddington	Stream	SP467508 to SP466510	Moderate	020-WV1-114002	28 June 2013	15	1055m (east)
Canal Feeder - Paradise Farm, Banbury Road, Lower Boddington, Daventry	Canal	SP481517 to SP482517	Moderate.	020-WV1-113004	6 June 2013	15	11m (south-west)
Stream - Magpie Farm, Culworth, Banbury, Oxon,	Stream	SP535536 to SP449450	Full	020-WV1-104006	26 June 2013	15	Within land required for construction of the Proposed Scheme
Pond - Magpie Farm, Culworth, Banbury, Oxon	Pond	SP542450	Full	020-WV1-104007	26 June 2013	15	56m (south-east)
Pond - Magpie Farm, Culworth, Banbury, Oxon	Pond	SP542451	Full	020-WV1-104008	26 June 2013	15	180m (south-east)
Pond - Magpie Farm, Culworth, Banbury, Oxon	Pond	SP538453	Full	020-WV1-104009	26 June 2013	15	12m (west)
Pond - Unregistered land at the south-east of Lower Thorpe Farm	Pond	SP539453	Full	020-WV1-104010	28 May 2013	15	Within land required for construction of the Proposed Scheme
Pond - Unregistered land at the south-east of Lower Thorpe Farm	Pond	SP537453 to SP538453	Full	020-WV1-104011	28 May 2013	15	Within land required for construction of the Proposed Scheme
Stream - Unregistered land at the	Stream	SP537452 to	Full	020-WV1-	1 February 2013	15	Within land required for construction of the Proposed

Watercourse or water body name (In all rows river catchment will be stated first followed by site name)	Feature type	OS grid reference (Start and Finish)	Level of access within required survey extent Full (100%)/majority (75% - 99%) /moderate (25-75%) /little (>25%) /none (0%)	Ecology survey code	Survey dates	CFA No.	Distance from land required for construction of the Proposed Scheme (m) and orientation
south-east of Lower Thorpe Farm		SP536453		105006			Scheme
Lake - Unregistered land at the south-east of Lower Thorpe Farm	Lake	SP537453 to SP537452	Full	020-WV1-105007	1 February 2013	15	Within land required for construction of the Proposed Scheme
Canal Feeder - Old House Farm, Banbury Road, Lower Boddington, Daventry	Canal	SP479519 to SP481518	Moderate	020-WV1-112007	27 June 2013	15	475m (south-west)
Canal Feeder - Old House Farm, Banbury Road, Lower Boddington, Daventry	Canal	SP460510 to SP464506	Moderate	020-WV1-114003	28 June 2013	15	1365m (north-east)

## 4.3 Deviations, constraints and limitations

4.3.1 Every effort was made to establish as complete a picture as possible of water vole activity and to fully record the presence of water voles and their burrows. However, the following constraints and limitations were encountered:

- field surveys were limited to locations where landowner permission had been obtained or areas that were accessible to the public. This resulted in some watercourses/water bodies (either partially or entirely) not being scoped in or out of the survey process;
- surveys were carried out from within the watercourse or from both banks of the watercourse wherever possible, except where access or health and safety constraints prevented this;
- topography and vegetation structure at some locations may have restricted surveys alongside some watercourses/water bodies. While it would still be possible to observe signs of water vole activity in such habitats, evidence may have been under-recorded at these locations;
- in order to complete the maximum number of surveys within the timeframe allowed, some were completed during periods when water levels were high and/or after periods of heavy rainfall. While signs of water vole activity can still be detected under such conditions, evidence may have been under-recorded as field signs may have been washed away or be less visible; and
- due to limitations on land access within the available survey timeframe, it was not possible to carry out two survey visits to each site between April and September or to allow a two month interval between surveys at all sites. This resulted in a restricted survey season with consequently fewer opportunities for encountering water vole field signs. Evidence of water vole activity at the sites where fewer surveys were carried out, or the interval between surveys was shorter, may be under recorded. This reduces the confidence in any negative results obtained during surveys.

4.3.2 Where particular limitations are relevant to the interpretation of the baseline these are discussed within the baseline section of the relevant CFA.

## 4.4 Baseline

4.4.1 During the surveys, no confirmed evidence of water voles was recorded. An account of habitat suitability, survey effort and access is provided below for each area.

### CFA7 Colne Valley

#### *River Colne*

4.4.2 Watercourses/ water bodies present in this area included the River Colne and a number of large lakes created by gravel extraction, surrounded by broad leaved woodland. Tilehouse Lake South (020-WV1-027004) within the Mid Colne Valley SSSI contained suitable habitat including areas of good food availability and connectivity.

Areas suitable for water vole were also identified along a section of the River Colne (020-WV1-027006) where the habitat provided areas of good food availability, low disturbance and good connectivity.

4.4.3 From east to west, the land required for construction of the Proposed Scheme crosses Harefield No. 2 Lake, Savay Lake, Korda Lake, Harefield Moor Lake, the Long Pond, the River Colne and it passes within 50m of Broadwater Lake and Tilehouse Lake South. Access at Broadwater Lake, Korda Lake, Bluewater Lake, Tilehouse Lake South, the Long Pond and the River Colne (020-WV1-027001, 020-WV1-027002, 020-WV1-027003, 020-WV1-027004, 020-WV1-027005 and 020-WV1-027006) was granted and field surveys were undertaken to establish habitat suitability. No evidence of water vole was confirmed in the extent of the land required for the construction of the Proposed Scheme.

4.4.4 Habitats at Broadwater Lake, Korda Lake, Bluewater Lake and Long Pond Lake were considered to be of low quality for water vole due to high levels of shading from trees and scrub, and the limited availability of suitable food sources due to woody species dominating these habitats (020-WV1-0270001, 020-WV1-027002, 020-WV1-027003, 020-WV1-027005, and 020-WV1-027007).

4.4.5 Areas around Savay Lake, Harefield No. 2 Lake and south of the Chiltern Railway along either side of the Grand Union Canal may potentially be suitable for water vole but in the main access was not granted for survey. In addition to the lack of accessibility, access to banks of the water bodies where surveys were undertaken was restricted due to dense vegetation cover, which will have resulted in evidence being under-recorded.

4.4.6 BBOWT reported water vole activity on the River Misbourne in 2010 at Denham. No specific locations for activity were provided, but the stretch of the River Misbourne at Denham is approximately 0.3km away from land required for construction of the Proposed Scheme at its closest point. Water vole has also been recorded over 75 times along the Grand Union Canal and the connecting habitats of lakes, ponds and ditches further south of the A40. The most recent records were from 2009 and range between 7m and 0.96km from land required for the construction of the Proposed Scheme. Mink (*Neovision vision*) has been recorded on 15 occasions, most recently in 2009, within 0.6km south-west of land required for construction of the Proposed Scheme. It is possible that a small number of water voles from nearby colonies are infrequently using the land that will be required for the construction of the Proposed Scheme. There remains the possibility that in future, water voles may disperse into this area and colonise the watercourses and water bodies if this habitat remains suitable, but it would require mink to be eradicated.

## CFA8 The Chalfonts and Amersham

### *The River Misbourne Catchment*

4.4.7 The majority of the land required for construction of the Proposed Scheme is in a bored tunnel under the Chalfonts and Amersham area (CFA8). However, suitable habitats to support water vole in this area include the River Misbourne and Shardeloes Lake which may be subject to effects from the Proposed Scheme.

4.4.8 Access was obtained for a survey of Shardeloes Lake (020-WV1-041002) and two sections of the River Misbourne that are adjacent to Shardeloes Lake (020-WV1-041001) at the northern end of this area. Most of these sections were fully accessed for survey; however, small parts were not surveyed because of restricted access to the river bank/lake shore (e.g. as a result of dense scrub, swamp vegetation in deep water). This was not considered to be a constraint to recording evidence of water vole. Field surveys recorded no evidence of water vole at these locations.

4.4.9 A further 78m section of the River Misbourne at Chalfont St. Giles (020-WV1-035001), was subject to a habitat assessment but was considered to be of low quality for water voles due to high levels of shading, a lack of suitable foraging habitat and unsuitable banks for burrow construction (canalised with retaining brick walls). Other sections of the River Misbourne were not accessed but potentially contained suitable habitat for water vole.

4.4.10 There are two areas of land required for construction of the Proposed Scheme which could not be accessed for survey but which may support water vole:

- an approximate 400m section of the River Misbourne north and south of Pheasant Hill in Chalfont St. Giles. This includes the 78m survey section that was scoped out as unsuitable (020-WV1-035001 - see above). Aerial photographs and surveys from public footpaths indicate that other parts of the River Misbourne in this location are shaded by trees and shrubs. However, there are also areas that may support dense stands of water margin vegetation and thus be suitable for water vole. There are eight desk study records from between 2008 and 2009 about 750m downstream of Pheasant Hill in the vicinity of Gerrard's Cross Golf Course. Given availability of habitat and the recent desk study records, it is not possible to discount the presence of this species from this location; and
- a section of the River Misbourne west of Shardeloes Lake where suitable habitat (stands of dense water-margin vegetation) was identified from public footpath surveys. It is not possible to discount the presence of water vole from this location.

### CFA9 Central Chilterns

4.4.11 There are no river catchments or water bodies present in the Central Chilterns (CFA9), therefore, no areas were selected for water vole field surveys. Desk study records show 16 records of water vole along the River Chess to the north-east of Amersham, which is between 3.0km and 3.8km from the land required for construction of the Proposed Scheme. A further record of water vole was located 1.5km south-west of the land required for construction of the Proposed Scheme near to Little Kingshill. Given the lack of habitat in this area, it is highly unlikely that water voles would be present despite desk study records.

## CFA10 Dunsmore, Wendover and Halton

### *The River Thame Catchment*

4.4.12 Suitable water vole habitat was recorded where the Stoke Brook crosses the northern edge of the Dunsmore, Wendover and Halton area (CFA10) and which is part of the River Thame catchment. The majority of Stoke Brook was accessible for survey within this area.

4.4.13 No evidence of water was found in any of the field surveys.

4.4.14 A small stretch of the River Thame catchment (020-WV1-056001) on the border of this area, located at the orchard north of Nash Lee Road, which is to the south-east of Stoke Mandeville, was considered to be unsuitable for water vole, due to high levels of shading by trees and scrub and grazing up to the stream edge.

4.4.15 There were 37 desk study records of water vole along the Grand Union Canal Wendover Arm, from Wendover to Aston Clinton; these were between 0.75km and 4.8km from the land required for the construction of the Proposed Scheme. However, the only location where access was not available for survey in this area was 0.18km of the Stoke Brook to the south-east of Stoke Mandeville. Despite desk study records from nearby, the absence of any field signs of water vole from extensive survey coverage suggests that it is highly unlikely this species is present.

## CFA11 Stoke Mandeville and Aylesbury

### *The River Thame Catchment*

4.4.16 Watercourses/water bodies present in the Stoke Mandeville to Aylesbury area (CFA 11) included the Stoke Brook, the Sedrup Ditch, the Hartwell Ditch, the Lower Hartwell Ditch, and the Bear Brook. All of these watercourses flow into the River Thame, which also flows through this area. At the northern end of this area, to the north-east of Aylesbury, the land required for construction of the Proposed Scheme abuts either side of the River Thame, with the Fleet Marston Brook flowing into the River Thame upstream of a point where the Proposed Scheme crosses it.

4.4.17 Suitable water vole habitat was found within the majority of the River Thame catchment. Areas of suitable habitat include; an approximate 0.34km section of Sedrup Ditch (020-WV1-058001) south of Aylesbury, two sections of the Stoke Brook (020-WV1-057001 and 020-WV1-057006) south of Stoke Mandeville, water bodies at Lower Hartwell, Hartwell House Hotel and Aylesbury Park Golf Course (020-WV1-062001, 002, 003, 004, 007, 020-WV1-063001, 002, 003, 004, 005, 006, 007, 008), which notably include the Hartwell Ditch (020-WV1-062004) and the Lower Hartwell Ditch (020-WV1-062003). All sections of these watercourses, and water bodies within Aylesbury Park Golf Course, were scoped in for detailed surveys due to the presence of good vegetation structure, availability of food sources and low levels of shading. The Fleet Marston Brook contained two sections of suitable water vole habitat, of approximately 2.3km in length in total, both at Putlowes Farm (020-WV1-064001 and 002). No evidence of water vole was found.

4.4.18 There were sections of watercourses and entire water bodies that were scoped out of further survey, as follows; sections of the Stoke Brook (020-WV1-057002, 003, 004 and 005).

020-WV1-058002) due to high levels of shading, areas of highly fluctuating water levels and limited food resources. The Sedrup Ditch (020-WV1-057005, 020-WV1-059001 and 020-WV1-060001) was considered to be of low suitability due to high levels of shading, limited available food sources and the regular drying out of the channel. Some parts of the watercourses and water bodies at Hartwell House Hotel (020-WV1-062005, 006 and 008) were scoped out due to intensive management of wetland vegetation. Access was granted to all of the watercourses and water bodies in CFA 11.

4.4.19 There were 37 desk study records of water vole within this area. Two of these records were from along the Grand Union Canal Wendover Arm, to the south-east of Weston Turville (2000), and west of Halton (2001). Both locations lie north-east of the land required for the construction of the Proposed Scheme, at distances of 1.45km and 1.67km respectively. A further 33 records (1998-2003) were located in and around Aylesbury along the Grand Union Canal Aylesbury Arm, from 0.86km and 3.66km north-east of the land required for the construction of the Proposed Scheme. One record (2005) was located on the River Thame just north of Aylesbury, 2.29km north-east of the land required for the construction of the Proposed Scheme. One record (1999) was located on the River Thame north of Stone, 1.22km south-west of the land required for the construction of the Proposed Scheme. Despite the suitability of habitat at Aylesbury Golf Course, near Lower Hartwell, and at Putlowes Farm, survey coverage was extensive and no evidence of water vole was found. On this basis, it is unlikely they are present in land required for construction of the Proposed Scheme in this area.

## CFA12 Waddesdon and Quainton

### *The River Ray Catchment*

4.4.20 Watercourses present in this area are the River Ray and tributaries, and the Muxwell Brook. These watercourses flow through farmland, with the exception of a section of the River Ray which flows through broadleaved woodland at Finemere Wood (to the north-east of land required for construction of the Proposed Scheme), and a section of the Muxwell Brook which flows through Calvert Landfill Site.

4.4.21 Suitable habitat was found within the Calvert estate along a 0.6km stretch of the Muxwell Brook (020-WV1-075001) and along a large ditch (020-WV1-076001). These areas of habitat were subject to detailed surveys as they contained several dense stands of wetland vegetation. No evidence of water vole was recorded.

4.4.22 The majority of the River Ray and its tributaries (020-WV1-074001, 020-WV1-074005 and 020-WV1-075003) in this area were wooded, which shaded out emergent vegetation, and were dry in places. Therefore, they were not considered suitable for water vole.

4.4.23 At the northern and southern ends of the CFA, there was access to the River Ray and its tributaries, but access was restricted in the central area of the CFA to the west of Quainton. No access was available to the Tetchwick Brook, which may support water vole habitat as it flows through flood meadows. A section of the River Ray downstream of Woodlands Farm could also not be accessed. No significant survey

constraints were noted during the surveys, but only one survey visit was carried out at each site accessed.

4.4.24 Desk study provided two records of water vole in this locality. One record (from 1999) is located just north of the A41, and west of Grendon Underwood, 4.7km south-west of the land required for the construction of the Proposed Scheme. The other record (from 2000) is located 0.63km south-west of the land required for the construction of the Proposed Scheme, to the east of Edgcott.

4.4.25 Suitable habitat for water vole in this area is localised, and fragmented between areas of intensive farmland and a landfill site. Furthermore, watercourses that may potentially support stretches of suitable habitat are either wooded and/or heavily shaded with vegetation. It is considered unlikely that water vole would colonise this area in the near future as no populations are known to be present close to this area.

### **CFA13 Calvert, Steeple Claydon, Twyford and Chetwode**

#### *The Padbury Brook Catchment*

4.4.26 Watercourses/ water bodies present in this area are the Padbury Brook, ditches connecting to the Padbury Brook and two large lakes north-east of the village of Charndon (Grebe Lake and Calvert Jubilee Lake). The majority of the Padbury Brook could be accessed.

4.4.27 Suitable water vole habitats were identified along a section of the Padbury Brook to the west of Three Bridge Mill within and adjacent to the land required for construction of the Proposed Scheme (020-WV1-081008 and 009). This section provided sloping banks for burrowing and potential food sources for water vole with good habitat connectivity. Habitat of moderate suitability was recorded around Grebe Lake (020-WV1-079001), where the diversity of grasses, reeds, sedges and rushes provide food sources, but shallow banks offered limited burrowing potential. Habitat of moderate suitability was also found at two ponds to the west of Three Bridge Mill (020-WV1-081002 and 003), a further stretch of the Padbury Brook at Church View Farm (020-WV1-082006, 007 and 020-WV1-083001) and along a drain at Steeple Claydon (020-WV1-080005), where steep banks and good food sources were present. Suitable habitat was also found at Calvert Jubilee Lake (020-WV1-080001) where stands of swamp vegetation occur. One of the ponds at Barton Grounds Farm (020-WV1-086009) was also considered suitable due to the presence of areas of reeds, providing a food source. No evidence of water vole was found.

4.4.28 The remaining watercourses/water bodies provided poor habitat for water voles due to high levels of shading, limiting marginal vegetation (020-WV1-086002, 003, 004, 007, 008 and 010, 020-WV1-081001 and 004, 020-WV1-087001, 002, 003 and 004, 020-WV1-079003, 020-WV1-080002, 003 and 004, 020-WV1-086012 and 013), poor vegetation structure, poor connectivity and lack of suitable banks for burrowing (020-WV1-086001, 005 and 006, 020-WV1-086014), or they were drying or completely dried out (020-WV1-081005, 006, 007 and 010).

4.4.29 Two locations in this area could not be accessed; the northern bank upstream of the Three Bridge Mill and the eastern bank at Preston Bassett and a pond to the south of School Lane could not be accessed due to owner permissions. Desk study records only

yielded one result for water vole in this locality in 2000 along the River Ray just south of Marsh Gibbon 3.61km to the south-west of the land required for the construction of the Proposed Scheme. No significant survey constraints were noted during the surveys, but only one survey visit was carried out at each site accessed.

4.4.30 In the absence of field signs, or nearby colonies of water vole, it was considered unlikely that water voles are present within the land required for construction of the Proposed Scheme in this area. However, given the presence of suitable habitat, it is possible that water voles could colonise this area in the future, if colonies are present nearby, the habitat remains suitable and no mink are present.

#### **CFA14 Newton Purcell to Brackley**

4.4.31 Watercourses/ water bodies present in the Newton Purcell to Brackley area (CFA14) included the River Great Ouse which passes through the land required for construction of the Proposed Scheme twice in this area, to the west of Westbury and to the north-east of Brackley. In addition, a number of tributaries of the River Great Ouse also cross the land required for construction of the Proposed Scheme. There are also a number of water bodies at Finmere Quarry.

#### *The River Great Ouse Catchment*

4.4.32 A stretch of the River Great Ouse immediately downstream of the land required for construction of the Proposed Scheme to the south of Westbury (020-WV1-090002) provided habitat with high potential for water voles, possessing good connectivity, steep banks for burrowing and abundant food sources. The nearby lake (020-WV1-091001) provided habitat of moderate suitability, with herbs present providing suitable food source. Grass cutting around the watercourse and water body surveyed may have obscured any evidence and only one survey was undertaken at each suitable site. No evidence of water vole was found.

4.4.33 The remaining watercourses/water bodies provided poor habitat for water voles due to high levels of shading, limited water-margin vegetation (020-WV1-099001 and 002, 020-WV1-097001, 002, 004 and 020-WV1-095001), poor vegetation structure (020-WV1-097003), or they were drying out or had completely dried out (020-WV1-098001, 002 and 020-WV1-091003).

4.4.34 Access was not possible to the area to the north of Turweston and to the area to the south of the A421. In particular, stretches of the River Great Ouse within land required for construction of the Proposed Scheme were not accessed for survey, but it is considered likely that suitable habitat is present in these areas.

4.4.35 Water vole activity was recorded downstream of the land required for construction of the Proposed Scheme at Water Stratford by BBOWT in 2010. No details of specific locations were provided, but the stretch of the River Great Ouse at Water Stratford is approximately 2.9km from land required for construction of the Proposed Scheme at its closest point. Water vole have been recorded on 19 occasions between 2009 and 2012 along the River Great Ouse to the west of Buckingham and to the south-east of Westbury, at distances varying from between 1.44km and 4.05km from land required for the construction of the Proposed Scheme.

4.4.36 Given the recent desk study records, and the presence of suitable water vole habitat downstream of the land required for construction of the Proposed Scheme, it is considered that there is the potential for water voles to colonise the River Great Ouse catchment provided that the habitat remains suitable, that there is sufficient connecting habitat to the closest known colonies, and that mink is absent from this area.

### *Finmere Quarry*

4.4.37 Full access was obtained to land required for survey at Finmere Quarry. The watercourses/water bodies present were subject to high levels of disturbance from quarrying activity and were poorly connected (020-WV1-089006, 007 and 010). In addition, some were subject to high levels of shading, limiting marginal vegetation (020-WV1-089001, 004, 005 and 009). Others had poor vegetation structure (020-WV1-089002), or they were drying or had completely dried out (020-WV1-089003 and 008). As a result, none were scoped in for further survey.

4.4.38 No records of water vole were provided from the desk study for this area. No evidence of water vole was found during field surveys.

4.4.39 In the absence of any desk study records, suitable habitat or evidence of field signs, it was considered unlikely that water voles are present in this area. It is unlikely that they will colonise in the future due to the absence of suitable habitat, high levels of disturbance and poor connectivity with surrounding watercourses.

### **CFA15 Greatworth to Lower Boddington**

4.4.40 Suitable water vole habitat was recorded along the following watercourses or water bodies in the Greatworth to Lower Boddington area (CFA15):

- two unnamed streams and several ditches at the southern end of this area, close to Halse Copse, which converge and ultimately flow into the River Great Ouse;
- Lower Thorpe Brook the River Cherwell and the network of streams, lakes and ponds, which flow into it;
- the Highfurlong Brook; and
- the Boddington Feeder Canal.

### *The River Great Ouse Catchment*

4.4.41 In this catchment, habitat appraisals were undertaken along all watercourses and water bodies requiring survey. This included an unnamed tributary of the River Great Ouse (020-WV1-099001 and 020-WV1-099002) and a small stream and several ditches in land surrounding Greatworth Hall (020-WV1-101001, 002, 003, 004 and 005). All of these watercourses/ water bodies provided poor habitat for water voles due to high levels of shading and a scarcity of water-margin vegetation. As a result, none of these locations were scoped in for further survey.

4.4.42 There were two records for water vole along the River Great Ouse west of Brackley recorded in 1997 at SP563381 which is 2.4km south-west of land required for the

construction of the Proposed Scheme. However, given distance and the poor quality of water vole habitat in this area, it is highly unlikely water vole would be present in land required for construction of the Proposed Scheme.

### *The River Cherwell Catchment*

4.4.43 Access was possible to the majority of the tributary stream feeding the River Cherwell. This included numerous ponds at Redhill Farm, Lower Thorpe Farm, Thorpe Mandeville Court, Culworth Grounds Farm and Magpie Farm (see Table 88). It also includes a number of unnamed streams and the Lower Thorpe Brook, all of which are located in between Culworth and Lower Thorpe (020-WV1-108002, 020-WV1-105003 and 020-WV1-105006). All of these areas were surveyed; however, most only supported isolated stretches of potential habitat separated by sections of watercourse/water body which were unsuitable for being over-shaded or shallow. The majority of these sections could be fully accessed for survey; however, small parts could not be surveyed due to restricted access to the river bank/lake shore (e.g. dense scrub, swamp vegetation in deep water). This was not considered to be a constraint to recording evidence of water vole. Field surveys recorded no evidence of water vole at these locations.

4.4.44 Only a small section of the River Cherwell could be accessed. On the east of Welsh Road, land at Culworth Mill (020-WV1-108001) was accessed for survey, although the southern bank of the river could not be fully surveyed due to its steepness. West of Welsh Road (020-WV1-108002), mammal burrows were found but with no evidence of water vole. In addition, late access precluded a second survey at both of these locations. A single record of water vole from 1998 was provided from the desk study for this area, located south of Cropredy, at SP464463, which is 4.44km south-west of the land required for construction of the Proposed Scheme. It cannot be confirmed if water voles are present in this area.

### *The Highfurlong Brook*

4.4.45 A small section (300m) of the Highfurlong Brook (020-WV1-113002) was accessible and was found not to be suitable for water vole due to high levels of shading habitat quality. However, the majority of the watercourse could not be accessed nor could the suitability of habitat be assessed. No evidence of water vole was recorded in the area surveyed. In addition, there are no desk study records of water vole at this locality. Given the lack of survey coverage the presence of this species cannot be discounted.

4.4.46 A habitat suitability assessment and a single survey of six ponds to the south of the Highfurlong Brook south-west of Aston Le Walls was carried out (020-WV1-112001, 002, 003, 004, 005, and 006). However, none were scoped in for further survey due to high levels of shading and limiting water-margin vegetation. No evidence of water vole were found and the desk study provided no records from this brook.

### *The Boddington Canal Feeder*

4.4.47 Access was obtained to the majority of land for the Boddington Canal Feeder (includes multiple channels). This included a small section of the canal feeder flowing from Boddington Reservoir to the Oxford Canal, south of Lower Boddington (020-WV1-113003, 020-WV1-113004, 020-WV1-114001 and 020-WV1-114003). This section

provided habitat of high suitability for water vole: gently sloping banks for burrowing and abundant food sources. However, no evidence of water vole was found at this location nor are there any desk study records.

4.4.48 The section of the canal east of Lower Boddington and south of Banbury Road (020-WV1-113005) was scoped out due to heavy shading and a lack of water-margin vegetation. A section of the canal which is directly within the land required for construction of the Proposed Scheme, west of the sewage works along Banbury Road, was scoped out for water vole as it was completely shaded by woodland with no foraging habitat.

4.4.49 The section of the canal between Hill Road and the sewage works could not be accessed for a survey and thus it cannot be confirmed if water vole is present. There are no desk study records from this location.

4.4.50 The majority of land was surveyed in this locality. Although no evidence of water vole was found, suitable habitat was found in a number of locations. It is possible in the future that water voles could colonise the suitable habitats in this area, if colonies are present nearby, the habitat remains suitable, and no mink are present.

# 5 Hazel Dormouse

## 5.1 Introduction

5.1.1 This section of the appendix presents a summary of the baseline data relating to hazel dormouse for the section of the Proposed Scheme that will pass through CFA7 to CFA15 inclusive.

## 5.2 Methodology

5.2.1 Details of the standard survey methodology employed for dormouse surveys are provided in Technical Note HS2 Ecological Surveys: Field Survey Methods and Standards which is included as an appendix to Volume 1. In accordance with this methodology, woodlands and hedgerows were surveyed during 2012 and 2013 utilising a range of survey methods including habitat scoping assessment, nest tubes, nest boxes and nut searches, to establish the presence or likely absence of hazel dormouse (hereafter referred to as dormouse).

5.2.2 Desk study records relating to dormouse within 5km of land required for construction of the Proposed Scheme were requested from the following sources:

- Bedfordshire, Cambridgeshire and Northamptonshire Wildlife Trust;
- Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT);
- Buckinghamshire and Milton Keynes Environmental Records Centre (BMERC);
- Greenspace Information for Greater London (GIGL);
- Hertfordshire Biological Records Centre;
- Northamptonshire Biodiversity Records Centre (NBRC);
- Northamptonshire County Council;
- Oxfordshire County Council; and
- Thames Valley Environmental Records Centre (TVERC).

5.2.3 A summary of the survey locations and the methodological details is provided in Table 91.

Table 91: Methodological details for dormouse nest tube surveys conducted within CFA 7 to 15 inclusive

Ecology Survey Code	Site	OS Centroid grid reference	No. of tubes deployed	Survey start - end Dates	Sum of indices of probability <sup>42</sup>	CFA
020-HD1-028-001	Mid Colne Valley SSSI: east of River Colne	504146, 189102	50	June 2012-June 2013	21	7
020-HD1-028-001	Mid Colne Valley SSSI: west of River Colne	504147, 189102	50	July 2012-June 2013	21	7

<sup>42</sup> Sum of the index of probability scores obtained for the months tubes were deployed, adjusted based on the number of tubes deployed in comparison with the standard of 50 tubes.

Ecology Survey Code	Site	OS Centroid grid reference	No. of tubes deployed	Survey start - end Dates	Sum of indices of probability <sup>42</sup>	CFA
020-HD1-029-001	Little Halings, Tilehouse Lane, Denham	503063, 189672	100	May 2013- September 2013	40	7
020-HD1-032-001	Land to the west of Shire Lane, Chalfont St Peter	501723, 192201	52	April 2013- September 2013	21	8
020-HD1-034-001	Ashwell's Farm, Chalfont St Giles	499939, 193338	50	June 2012- November 2012	20	8
020-HD1-038-001	Quarrendon Farm, Quarrendon Farm Lane, Coleshill, Amersham <sup>43</sup>	496310, 195780	150, 5 dormouse boxes	April 2013- September 2013	63	8
020-HD1-044-001, 020-HD1-045-002	Mantle's Farm, Chalk Lane, Hyde Heath, Amersham	492367, 200151; 491940, 200084	150	May 2013- September 2013	63	9
020-HD1-046-001	The Coppice and Sibley's Coppice, South Heath, Great Missenden	490820, 201735	50	July 2012- June 2013	23	9
020-HD1-046-002	Land to the west of Kings Lane, South Heath, Great Missenden	490939, 201697	50	June 2012- November 2012	20	9
020-HD1-047-001	Mulberry Park Hill, Potter Row, Great Missenden	490167, 202637	50	June 2012- August 2013	27	9
020-HD1-052-003	Section of Chiltern Network Rail Land between Road Barn Farm and Nash Lee lane, Wendover	487355, 206539	50	April 2013- September 2013	21	10
020-HD1-053-001	Grove Farm, London Road, Wendover	487088, 207134	50	July 2012- June 2013	23	10
020-HD1-056-001	Two parcels of land on the north side of Nash Lee Road, Terrick ,	484676, 209012	71	April 2013- September 2013	21	10
020-HD1-066-002	Land to the south and north of the A41 at Fleet Marston	477944, 216384.	50	June 2012- November 2012	20	11
020-HD1-066-001	Land to the north of Shepcote Hill Farm, Upper Winchendon	476921, 215491.	50	June 2012- November 2012	20	11
020-HD1-068-003	Lower Blackgrove Farm, Waddesdon	476424, 217056	100	April 2013- September 2013	42	11

<sup>43</sup> Woodland at Quarrendon Farm is above a section of the route which is in bored tunnel. However, given high quality habitat for hazel dormouse at this site, a survey was commissioned to provide evidence of hazel dormouse presence in the wider landscape to compensate for areas where no access was available.

Ecology Survey Code	Site	OS Centroid grid reference	No. of tubes deployed	Survey start - end Dates	Sum of indices of probability <sup>42</sup>	CFA
020-HD1-068-001	Land to the east of Blackgrove Road, Waddesdon	475944, 217204	50	June 2012- November 2012	20	12
020-HD1-068-002	Land to the west of Blackgrove Road, Waddesdon	475495, 217164	50	June 2012- November 2012	20	12
020-HD1-074-001	Woodlands Farmhouse, Doddershall, Quainton	471387, 221169	60	August 2012- April 2013	22	12
020-HD1-074-002	Land at Woodlands Farm, Edgcott Road, Doddershall (BBOWT)	471570, 221576	60	June 2012- November 2012	20	12
020-HD1-074-003	Woodlands Lodge, Doddershall	471549, 221229	60	June 2012- November 2012	20	12
020-HD1-076-001, 020-HD1-078-001, 020-HD1-078-004	Calvert Estate	469584, 223221, 470040, 222365, 469070, 224380, 468620, 223773	350	April 2013- September 2013	147	13
020-HD1-076-002	Calvert Waste Terminal Central and south-west sections	470830, 222515	150	April 2013- September 2013	63+42	12 and 13
020-HD1-079-001	Calvert Jubilee Nature Reserve	470830, 222515	96	June 2012- November 2012	30	13
020-HD1-079-003	Section of east/west Railway Line between Queen Catherine Road and Main Street, Calvert	470254, 226155 467735, 225481	126	April 2013- September 2013	42	13
020-HD1-080-002	Stone Court Farm, West Street, Steeple Claydon	468418, 226163	60	May 2013- September 2013	21	13
020-HD1-080-003	Elm Tree Farm, West Street, Steeple Claydon, Buckingham	468419, 226004	100	April 2013- September 2013	42	13
020-HD1-082-001	Cowley Farm, Preston Bissett, Buckingham	466144, 228828	50	August 2012- June 2013	23	13
020-HD1-086-002	Barton Hill Farm, Newton Purcell, Buckingham	463325, 230252, 463481, 229887	79	April 2013- September 2013	21	13
020-HD1-087-003	Land forming part of the former Rugby to Calvert Railway Line, including Bridge 543, east of Newton Purcell	463180, 230596	50	June 2012- November 2012	20	13
020-HD1-087-001	Land Adjoining Shelswell Inn	462990, 231049	50	June 2012 - November 2012	20	14
020-HD1-088-	Finmere Quarry	462824, 232420	50	July 2012-	23	14

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Ecology Survey Code	Site	OS Centroid grid reference	No. of tubes deployed	Survey start - end Dates	Sum of indices of probability <sup>42</sup>	CFA
004				August 2013		
020-HD1-088-001	Land to the north-west of the road leading from Newton Purcell to Finmere	462886, 231396	50	June 2012- November 2012	20	14
020-HD1-089-003	Warren Farm, Banbury Road, Finmere, Buckingham	462450, 233046	100, ( with Land adjoining Warren Farmhouse)	April 2013- September 2013	42	14
020-HD1-089-004	Land adjoining Warren Farmhouse, Finmere	462252, 233144	100 (joined with Warren Farm)	April 2013- September 2013	42	14
020-HD1-090-001	Land to the north of Warren Farm, Finmere	462461,233566	88	June 2013- September 2013	24	14
020-HD1-095-001	Northfield House, Turweston	460217, 237813	50	April 2013- September 2013	21	14
020-HD1-099-001	Halse Grange Farm, Halse	457061, 241132	50	June 2012- November 2012	20	14
020-HD1-100-001	Bungalow Farm, Greatworth, Banbury	457175, 242528	150	April 2013- September 2013	63	15
020-HD1-101-001	Greatworth Hall Farm, Helmdon Road, Greatworth,	456084, 242767	66	April 2013- September 2013	21	15
020-HD1-101-002	Greatworth Fields Farm, Greatworth, Banbury	456532,242294	100	April 2013- September 2013	42	15
020-HD1-104-001	Unregistered land at the south-east of Lower Thorpe Farm	453917, 245182	100	April 2013- September 2013	42	15
020-HD1-105-001	Culworth Grounds Farm, Thorpe Mandeville	453458, 246237	60	August 2012- June 2013	20	15
020-HD1-105-002	Land to the west of Banbury Lane, Thorpe Mandeville, Banbury	453122, 245443	150	April 2013- September 2013	63	15
020-HD1-114-001	The Grange, Hill Road, Lower Boddington,	448028,252272	86	May 2013- September 2013	30	15
020-HD1-116-001	Fox Covert, Upper Boddington	446267, 253590	50	June 2012- November 2012	20	15

## 5.3 Deviations, constraints and limitations

5.3.1 Every effort was made to establish as complete a picture as possible of dormouse presence. However, the constraints and limitations outlined in Section 1.3 applied.

5.3.2 All field surveys were limited to locations where landowner permission had been obtained or areas that were readily accessible such as public footpaths. As such, not all suitable habitat within the land required for construction of the Proposed Scheme was subject to dormouse habitat appraisal surveys and subsequent dormouse nest tube surveys. A summary of the sites inaccessible for survey are provided in Table 92.

5.3.3 Best practice guidance<sup>44</sup> requires a minimum score of 20 survey effort points to be secured, based on the index of probability of finding dormouse in each calendar month. The system for securing survey points is based on a prescribed survey effort which is that nest tubes for survey should be spaced in all suitable habitats at 15-20m intervals with a minimum of 50 tubes per site (full details of this system method are presented in the Field Survey Methods and Standards).

5.3.4 In order to secure 20 survey effort points within the timeframe permitted by the project, it was necessary to double, and where feasible, triple the number of tubes used within areas of suitable habitat. This method was endorsed by a recognised authority on dormouse. At certain sites where nest tube density was increased to complete surveys in a shorter period of time, it subsequently became possible to continue surveys throughout the survey season. Therefore, for a small number of sites listed in Table 91, the sum of indices of probability substantially exceeded 20 points (i.e. a larger survey effort than the minimum required by best practice was deployed).

5.3.5 The timing of dormouse surveys included the key months of May, August and September 2013 (when dormouse are most likely to use nest tubes) to increase the probability of detecting dormouse.

Table 92: Summary of suitable sites where access was denied within CFA 7 to 15 inclusive:

Ecology survey code	Location	Centroid OS grid reference	CFA	Approximate distance from the Proposed Scheme (m) and orientation
020-HD1-028-003	Land between Tilehouse Lane and the A412	503478, 189920	7	Within the Proposed Scheme
020-HD1-036-001	Farmland north of Bottom House Farm Lane	497554, 194979	8	Within the Proposed Scheme
020-HD1-036-002	Land at Bottom House Farm Lane, Chalfont St Giles	498142, 195080	8	Within the Proposed Scheme
020-HD1-040-001	Land south-west of Amersham	494314, 197296	8	Within the Proposed Scheme
020-HD1-044-003	Woodland to the north of the A413, Little Missenden	491417, 199712	9	Within the Proposed Scheme

<sup>44</sup> Bright, P, Morris, P and Mitchell-Jones, T (2006), *The dormouse conservation handbook second edition*. English Nature. Peterborough.

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<b>Ecology survey code</b>	<b>Location</b>	<b>Centroid OS grid reference</b>	<b>CFA</b>	<b>Approximate distance from the Proposed Scheme (m) and orientation</b>
020-HD1-044-004	Woodland lying to the south of Weedon Hill	494398, 199162	8	Within the Proposed Scheme
020-HD1-044-005	Woodland to the south of Hyde Heath Road	492230, 200279	9	Within the Proposed Scheme
020-HD1-044-006	Land on the south side of Hyde Heath Road, Hyde Heath	492633, 200518	8	Within the Proposed Scheme
020-HD1-045-003	Land either side of Hyde lane including Hedgemoor Wood, south-east of Great Missenden	491682, 200612	9	Within the Proposed Scheme
020-HD1-045-004	Woodland to the east of Hyde Lane	491742, 200407	9	Within the Proposed Scheme
020-HD1-045-005	Land south of Hyde End	491850, 200988	9	Within the Proposed Scheme
020-HD1-045-006	Land on the west side of Hyde Lane	491270, 200459	9	Within the Proposed Scheme
020-HD1-046-003	Land between South Heath and Chesham Road	491516, 201617	9	Within the Proposed Scheme
020-HD1-048-002	Farmland north of Leather Lane	489318, 203613	9	Within the Proposed Scheme
020-HD1-052-001	Land lying to the west of London Road	487320, 206283	10	Within the Proposed Scheme
020-HD1-052-002	Farmland to the west of London Road	487713, 206194	10	Within the Proposed Scheme
020-HD1-057-001	Land on the west side of Old Risborough Road	483119, 209508	11	Within the Proposed Scheme
020-HD1-062-001	Land between south-west Aylesbury and Stone	479984, 214069	11	Within the Proposed Scheme
020-HD1-063-001	Land west of golf club	478399, 213171	11	Within the Proposed Scheme
020-HD1-074-004	Land at Finemere Wood, Quainton	471869, 221878	12	0.7m from the Proposed Scheme
020-HD1-074-005	Farmland to the west of the disused railway, Quainton	470789, 221566	12	Within the Proposed Scheme
020-HD1-074-006	Land on the north side of the Road leading from Edgcott to Quainton	471027, 221075	12	13m from the Proposed Scheme
020-HD1-075-002	Land near Claydon Estate, Middle Claydon	471307, 223058	12	Within the Proposed Scheme
020-HD1-076-003	Lane at Claydon Estate, Steeple Claydon	470237, 223414	12	Within the Proposed Scheme
020-HD1-077-001	Lane at Claydon Estate, Steeple Claydon	469168, 224361	13	Within the Proposed Scheme

<b>Ecology survey code</b>	<b>Location</b>	<b>Centroid OS grid reference</b>	<b>CFA</b>	<b>Approximate distance from the Proposed Scheme (m) and orientation</b>
020-HD1-077-002	Lane at Claydon Estate, Steeple Claydon	469891, 224151	12	Within the Proposed Scheme
020-HD1-079-002	Farmland north of Grebe Lake	468371, 225549	13	Within the Proposed Scheme
020-HD1-080-004	Farmland north of Grebe Lake	467696, 226169	13	Within the Proposed Scheme
020-HD1-083-003	Land at Preston Bissett, Buckinghamshire	465595, 228347	13	Within the Proposed Scheme
020-HD1-083-004	Land north of Mill Mound, Preston Bissett	465811, 228560	13	Within the Proposed Scheme
020-HD1-084-001	Land to the south-west of Ash Spinney, Chetwode	465038, 228557	13	Within the Proposed Scheme
020-HD1-084-002	Farmland to the south-east of Chetwode	464812, 228924	13	Within the Proposed Scheme
020-HD1-084-003	Land south of Chetwode	465193, 228510	13	Within the Proposed Scheme
020-HD1-086-001	Farmland at Newton Purcell	463153, 229783	13	Within the Proposed Scheme
020-HD1-087-004	Farmland lying on the north-west and south-east side of a road leading from Bicester to Buckingham, Shelswell	463029, 231547	13	Within the Proposed Scheme
020-HD1-088-006	Land on the south side of the A421, Brackley	461281, 231281	14	Within the Proposed Scheme
020-HD1-090-002	Farmland at Church Lane, Mixbury, Brackley	461642, 234547	14	Within the Proposed Scheme
020-HD1-090-003	Farmland at Banbury Road, Finmere	461932., 233268	14	Within the Proposed Scheme
020-HD1-091-001	Farmland south-west of Westbury	460723, 234908	14	Within the Proposed Scheme
020-HD1-091-002	Land forming part of disused Verney Junction to Banbury railway	462053, 234557	14	Within the Proposed Scheme
020-HD1-092-001	Two parcels of land adjoining Grovehill Farm, Turweston, Brackley	460873, 236515	14	Within the Proposed Scheme
020-HD1-092-002	Land forming part of disused Verney Junction to Banbury railway at Mill house farm	462143, 235899	14	Within the Proposed Scheme
020-HD1-092-003	Land forming part of disused Verney Junction to Banbury railway at Grove farm	462586, 237189	14	Within the Proposed Scheme
020-HD1-092-004	Land forming part of disused Verney Junction to Banbury railway at Fulwell Farm	462068, 235064	14	Within the Proposed Scheme
020-HD1-093-001	Glebe Farm, south of Turweston	460437, 237010	14	Within the Proposed Scheme

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<b>Ecology survey code</b>	<b>Location</b>	<b>Centroid OS grid reference</b>	<b>CFA</b>	<b>Approximate distance from the Proposed Scheme (m) and orientation</b>
020-HD1-094-001	Land near Turweston Airfield, Turweston	461012, 238079	14	Within the Proposed Scheme
020-HD1-094-002	Land forming part of disused Verney Junction to Banbury railway at Field Farm House, Turweston	460751, 237890	14	Within the Proposed Scheme
020-HD1-095-002	2 Versions bungalow, Northampton Road, west of Turweston	459510, 238540	14	Within the Proposed Scheme
020-HD1-096-001	Woodland at Iletts farm, west of Whitfield	459721, 239449	14	Within the Proposed Scheme
020-HD1-096-002	Land on the east and west side of the road leading from Brackley to Helmdon, Radstone	458138, 241237	14	Within the Proposed Scheme
020-HD1-096-003	Cold Harbour Farm, Radstone, Brackley,	460324, 240785	14	4m from the Proposed Scheme
020-HD1-097-002	Land on the west side of the road leading from Brackley to Helmdon, Radstone	458251, 240221	14	Within the Proposed Scheme
020-HD1-102-001	Land lying to the north of Helmdon Road, Greatworth	455588, 243297	15	Within the Proposed Scheme
020-HD1-105-003	Woodland to the north-west of lower Thorpe farm, Thorpe Mandeville	453400, 245530	15	Within the Proposed Scheme
020-HD1-106-002	Land west of Culworth	452519, 246966	15	Within the Proposed Scheme
020-HD1-107-001	Edgcote Mill and House, south of Culworth Road, Edgcote	449464, 246704	15	Within the Proposed Scheme
020-HD1-108-001	A plantation woodland at Warding Gate Farm, Edgcote, Chipping Warden	450946, 247560	15	Within the Proposed Scheme
020-HD1-108-002	A narrow belt of woodland along river Cherwell at Trafford House Farm, Chipping Warden, east of Welsh Road	451865, 248279	15	4m from the Proposed Scheme
020-HD1-108-003	Trafford Bridge Marsh, Culworth Mill and Osierbed Spinney	452036, 247923	15	Within the Proposed Scheme
020-HD1-109-001	Two parcels of land on the north-east and south-west sides of Welsh Road, Chipping Warden	450625, 249479	15	Within the Proposed Scheme
020-HD1-109-002	Small woodland at Beeches Farm, north of Culworth Road, Chipping Warden	450742, 249021	15	Within the Proposed Scheme
020-HD1-111-001	Manor Farm, Aston Le Walls	449230, 250753	15	Within the Proposed Scheme
020-HD1-112-001	Land lying to the south-west of Welsh Road, Aston Le Walls	448615, 250939	15	Within the Proposed Scheme
020-HD1-112-002	Land lying to the south-west of Welsh Road, Aston Le Walls	448379, 250752	15	Within the Proposed Scheme
020-HD1-112-003	Woodland along Highfurlong Brook at Old House Farm, south of Banbury Road, Lower Boddington	447731, 251072	15	Within the Proposed Scheme

Ecology survey code	Location	Centroid OS grid reference	CFA	Approximate distance from the Proposed Scheme (m) and orientation
020-HD1-112-004	Land at Banbury Road, Lower Boddington, Daventry	448063, 251171	15	Within the Proposed Scheme
020-HD1-112-005	Land south-west of Banbury Road, Lower Boddington.	448505, 251442	15	Within the Proposed Scheme
020-HD1-113-001	Woodland along Highfurlong Brooke with connectivity at Manor Farm, south-west of Banbury Road, south of Lower Boddington	448260, 251494	15	Within the Proposed Scheme
020-HD1-115-001	Land on the north side of the road leading from Worm Leighton to Upper Boddington	446626, 253611	15	Within the Proposed Scheme

## 5.4 Baseline

5.4.1 A habitat scoping assessment was undertaken of woodland and hedgerow habitat where access was permitted. The following types of woodland and hedgerow were considered as potentially suitable for dormouse and were surveyed:

- woodlands over 2ha in area, supporting a good diversity of broadleaved tree species at canopy level;
- areas of newly planted woodland with either stands of deciduous trees and / or connectivity to areas of mature woodland;
- coniferous woodland with either stands of deciduous trees or connectivity to deciduous woodland;
- both small (approximately 2ha) and large (approximately 10ha) areas of woodland connected to and/or adjacent to larger areas of woodland outside the required survey area (survey area detailed in the Field Survey Methods and Standards document); and
- intact, species-rich hedgerows with good connectivity to areas of woodland, which were not overly managed, and formed part of the wider hedgerow network (hedges had to be able to hold a minimum of 50 survey nest tubes to qualify).

5.4.2 Factors such as diversity of shrub species within the understorey, presence of key species such as hazel (*Corylus avellana*), honeysuckle (*Lonicera* spp.) and bramble (*Rubus fruticosus* agg.) and good structural linkage between the canopy and understorey, were considered when assessing the suitability of the woodland habitats.

5.4.3 All sites where presence/absence surveys were undertaken achieved a minimum search effort score of 20 points.

5.4.4 Sites where suitable habitat areas were considered too small to support a dormouse population (and consequently unable to support 50 dormouse nest tubes), were scoped out.

5.4.5 No evidence of dormouse was identified during the field surveys. A review of desk study records within a 5km buffer was undertaken and is presented below by each CFA.

5.4.6 An overview of potentially suitable dormouse habitat present within each CFA (7 to 15 inclusive) is detailed below.

### CFA7 Colne Valley

5.4.7 The land required for construction of the Proposed Scheme in this area consists mainly of arable fields and numerous water-filled gravel pits. Semi-natural broadleaved woodland is present within the central section of the area and has been identified as suitable for dormouse due to its diverse structure and range of species present.

5.4.8 Surveys were undertaken within semi-natural broadleaved woodlands including Little Halings Wood and Great Halings Wood (020-HD1-029-003) and Ranston Covert (020-HD1-028-001). These woodlands are reasonably diverse and are dominated by beech, (*Fagus sylvatica*), ash (*Fraxinus excelsior*), pedunculate oak (*Quercus robur*) with an understorey of holly (*Ilex aquifolium*) and occasional rhododendron (*Rhododendron spp.*).

5.4.9 These surveys were therefore robust in their approach and this gives confidence that any significant dormouse population would have been detected if present. No evidence of dormouse was identified during the field surveys nor any desk study records of dormouse from this area.

5.4.10 Mixed plantation woodland at Hillingdon (020-HD1-024-001) and broadleaved semi-natural woodland with areas of coniferous plantation (020-HD1-028-003) to the north of Denham were identified as suitable for dormouse from aerial photography and surveys from Public Rights of Way (PROW). However, due to restricted access, these areas were not surveyed. Both areas include habitat in land required for construction of the Proposed Scheme.

5.4.11 Although not all suitable habitats were surveyed for dormouse, the surveys that were undertaken achieved a wide coverage of suitable dormouse habitat in this area. It is therefore considered that dormouse is unlikely to be present within land required for the construction of the Proposed Scheme, although this cannot be confirmed for all sites.

### CFA8 The Chilterns and Amersham

5.4.12 The land required for construction of the Proposed Scheme in this area consists mainly of arable fields and poor semi-improved grassland. Towards the more southerly extent of the area, hedgerows dominated by bramble, holly, blackthorn (*Prunus spinosa*), dog rose (*Rosa canina*), elder (*Sambucus nigra*) and hazel are considered suitable for dormouse due to the diversity of shrub species and connections to smaller areas of woodland and scrub. The wider landscape of the Buckinghamshire Chilterns is highly suitable for dormouse, with frequent woodlands, many of which are ancient woodland.

5.4.13 Surveys were undertaken within hedgerows located at Ashwell's Farm (020-HD1-034-001) and Shire Lane (020-HD1-032-001). There are limited areas of broadleaved semi-natural woodland within the land required for construction of the Proposed Scheme in this area; however, surveys were undertaken in two areas of semi-natural broadleaved woodland, known as Rodger's Wood and David's Wood (020-HD1-038-001), in order to provide information on dormouse populations in the wider landscape. These woodlands are dominated by beech with frequent pedunculate oak, rowan (*Sorbus aucuparia*) and sycamore (*Acer pseudoplatanus*) with an understorey dominated by holly, frequent cherry laurel (*Prunus laurocerasus*) and bramble.

5.4.14 These surveys are, therefore, robust in their approach and this gives confidence that any significant dormouse population would have been detected, if present. No evidence of dormouse was identified during the field surveys. A single desk study record from 1998 was present in Rushy meade, west of Brentford Wood which is 990m from the land required for construction of the Proposed Scheme in the vicinity of Coleshill, Amersham.

5.4.15 Hedgerows along Bottom House Farm Lane (020-HD1-036-001, 020-HD1-036-002) and south-west of Amersham (020-HD1-040-001) were identified as suitable for dormouse from aerial photography and surveys from public footpaths. However, due to restricted access, these areas have not been surveyed. Both areas include habitat in the land required for construction of the Proposed Scheme.

5.4.16 Although, a large number of sites could not be accessed to carry out a survey for dormouse; those surveys that were undertaken achieved wide coverage of suitable habitat in this area. It is therefore considered that dormouse is unlikely to be present, although this cannot be confirmed for all areas.

### CFAg Central Chilterns

5.4.17 The land required for construction of the Proposed Scheme in this area consists mainly of improved grassland and arable fields which are intersected by areas of semi-natural broadleaved and plantation woodland. Within the wider habitats, the field boundaries are lined with species rich hedgerows. In general these hedgerows supported more than three woody species, and are broad and tall with limited gaps. Distinctive species include hornbeam (*Carpinus betulus*), elder, field maple (*Acer campestre*), pedunculate oak, ash, elm (*Ulmus spp.*) and hazel.

5.4.18 Surveys were undertaken at four locations in this area (see Table 91) within both woodland and hedgerow habitats. The woodlands surveyed include Mantles Wood (020-HD1-044-001, 020-HD1-045-002), which is a large, diverse woodland comprising oak, beech and hornbeam with a holly and hazel understorey. Further north within the area, surveys were undertaken at Sibley's Coppice (020-HD1-046-001, 020-HD1-046-002), which is dominated by pedunculate oak, sycamore and beech and to the northwest, within beech dominated hedgerows (020-HD1-047-001).

5.4.19 No evidence of dormouse was identified during the field surveys. Two desk study records from 2005 and 2006 are present in Brockswood and Barns Perks Lane, respectively. Both are located 3636m from the land required for construction of the Proposed Scheme in the vicinity of Hughenden.

5.4.20 Eight sites, which are predominantly broadleaved woodland, were identified through aerial photography and on-site scoping assessments as having suitable habitat for dormouse. However, due to restricted access, these areas were not surveyed. These include:

- mixed plantation woodland to the north of the A413, Little Missenden (020-HD1-044-003), in land required for the construction of the Proposed Scheme;
- broadleaved and coniferous woodland to the south of Hyde Heath Road (020-HD1-044-005), in land required for the construction of the Proposed Scheme;
- broadleaved and coniferous woodland at land either side of Hyde Lane including Hedgemoor Wood, south-east of Great Missenden (020-HD1-045-003), in land required for the construction of the Proposed Scheme;
- mixed woodland to the east of Hyde Lane (020-HD1-045-004), in land required for the construction of the Proposed Scheme;
- hedgerow with trees to the south of Hyde End (020-HD1-045-005), in land required for the construction of the Proposed Scheme;
- small pocket of mixed woodland on land to the west side of Hyde Lane (020-HD1-045-006), in land required for construction of the Proposed Scheme;
- hedgerow with trees at land between South Heath and Chesham Road (020-HD1-046-003), in land required for the construction of the Proposed Scheme; and
- a narrow belt of broadleaved woodland at farmland north of Leather Lane (020-HD1-048-002), in land required for the construction of the Proposed Scheme.

5.4.21 Although not all suitable habitats were surveyed for hazel dormouse, the surveys that were undertaken achieved a wide coverage of suitable dormouse habitat in this area. Therefore, it is considered that dormouse is unlikely to be present within land required for the construction of the Proposed Scheme, although this cannot be confirmed for all sites.

**CFA10 Dunsmore, Wendover and Halton**

5.4.22 The habitats surveyed within the area comprised hedgerows and planted linear belts of broadleaved trees and scrub. The hedgerows were identified as species-rich, and many formed field boundaries, providing connectivity across large arable landscapes. The habitats within the wider area comprised large areas of semi-natural broadleaved woodland; notably Wendover Woods to the east and various smaller woodlands to the west of land required for the construction of the Proposed Scheme. Surveys were undertaken at three locations in this area. These include the hedgerows to the north side of Nash Lee Road, Terrick (020-HD1-056-001); planted linear belts of vegetation alongside the roads at Grove Farm, Wendover (020-HD1-053-001) and a section of the Chiltern Network Railway corridor between Road Barn Farm and Nash Lee Lane (020-HD1-052-003). No evidence of dormouse was found during the surveys. There is a

single desk study record from Wendover Woods in 2004, 2416m east from land required for construction of the Proposed Scheme.

5.4.23 Hedgerows to the west of London Road (020-HD1-052-001, 020-HD1-052-002) were identified as suitable for dormouse from aerial photography and surveys from public footpaths. However, due to restricted access, these sites were not surveyed. Both sites include habitat within land required for construction of the Proposed Scheme.

5.4.24 Although not every area of suitable dormouse habitat identified was surveyed, those surveys that were undertaken achieved a wide coverage of the suitable dormouse habitat within this area. Therefore, it is considered that dormouse is unlikely to be present within land required for the construction of the Proposed Scheme, although this cannot be confirmed for all areas.

### **CFA11 Stoke Mandeville and Aylesbury**

5.4.25 Potentially suitable habitats for dormouse were more limited within this area compared to others, due to the higher proportion of arable habitat, and lower cover of semi-natural broadleaved woodland. Hedgerows within this area were typically less diverse than in other areas. Distinctive species included hawthorn (*Crataegus spp.*), blackthorn, dog rose, and field maple. Where woodland habitat was present, it was small in size and had been recently planted.

5.4.26 Surveys were undertaken at three locations in this area (see Table 91) within mostly hedgerow habitats. The sites surveyed included areas of farmland around Waddesdon, which contained outgrown blackthorn, elm, and hawthorn dominated hedges.

5.4.27 No evidence of dormouse was found and there were no desk study records for this area.

5.4.28 Three sites, which are large landholdings, were identified through aerial photography and on-site scoping assessments as being potentially suitable for dormouse. All three are in land required for the construction of the Proposed Scheme; however due to restricted access they were not surveyed. These include:

- small areas of plantation woodland and species rich hedgerows in the land surrounding Lower Hartwell, (020-HD1-063-001); and
- plantation mixed woodland and hedgerows at Aylesbury Park Golf Club, (020-HD1-062-001).

5.4.29 Access was not granted for the majority of this area and as such dormouse surveys were not undertaken at some very large and ecologically diverse sites. Therefore, it cannot be concluded that dormouse are not present in this area, despite their absence from the three locations surveyed.

### **CFA12 Waddesdon and Quainton**

5.4.30 Habitats in this area largely comprise arable fields, poor semi-improved grassland and hedgerows. The landscape in the north part of this area includes several large expanses of semi-natural broadleaved ancient woodland, which are adjacent to the

land required for construction of the Proposed Scheme; these include Finemere Wood, Romer Wood and Sheephause Wood. Each of these woods is likely to be highly suitable for dormouse. A number of land parcels surveyed within this area were directly connected to these woods.

5.4.31 Surveys were undertaken at six locations in this area (see Table 91) in both woodland and hedgerow habitats. The sites surveyed include recently developed woodland containing blackthorn, adjoining Finemere wood (020-HD1-074-002), which is a large, ancient woodland. Surveys were also undertaken in the central and southern areas of the Calvert Waste site (020-HD1-076-002) which contained broadleaved woodland species including oak, hazel and ash, and scrub including hawthorn and bramble.

5.4.32 No evidence of dormouse was identified during the field surveys in this area and there were no desk study records.

5.4.33 Six sites, which consisted of woodland and farmland, were identified through aerial photography and on-site scoping assessments, as containing suitable habitat for dormouse. However, access was not available to carry out a dormouse survey. This included the following locations:

- land at Finemere Wood, Quainton, (020-HD1-074-004) 0.7m from land required for construction of the Proposed Scheme;
- farmland with hedges to the west of the disused railway at Quainton, (020-HD1-074-005), in land required for construction of the Proposed Scheme;
- farmland with hedges on the north side of the road leading from Edgcott to Quainton (020-HD1-074-006), 13m from land required for construction of the Proposed Scheme; and
- farmland with hedges and woodland at the Claydon Estate, Middle Claydon (020-HD1-076-003, 020-HD1-077-002), in land required for construction of the Proposed Scheme

5.4.34 Dormouse surveys achieved wide coverage across the majority of suitable habitat in or adjacent to the land required for construction of the Proposed Scheme. However, there were two particular locations where survey coverage was deficient owing to a lack of access: farmland around Doddershall House and Sheephause Wood. It cannot be concluded that dormouse are not present in these specific locations. At remaining locations, although survey coverage was not exhaustive as a result of a lack of site access, sufficient areas of suitable habitat were sampled and it is unlikely that dormouse is present in the land required for construction of the Proposed Scheme.

### **CFA13 Calvert, Steeple Claydon, Twyford and Chetwode**

5.4.35 CFA13 includes various small areas of woodland and scrub both within the Calvert Estate and along the adjacent railway lines, which are considered potentially suitable habitat for dormouse. In particular, the woodland and hedgerows surrounding the Calvert Jubilee Nature Reserve LWS are largely undisturbed and support a good diversity of broadleaved species, including hazel and bramble. The remaining habitat within the area is largely arable and poor semi-improved grassland. Hedgerows are

abundant but these are typically less botanically diverse within this CFA compared to others. However, they do provide potential connecting corridors across the wider landscape.

5.4.36 Surveys were undertaken at seven locations in this area (see Table 91) within both woodland and hedgerow habitats. Calvert Jubilee contains moderately species-rich scrub and semi-natural broad-leaved woodland (020-HD1-079-001). Further north, surveys were undertaken at Barton Hill and Barton Grounds Farm (020-HD1-086-002, 020-HD1-087-003) which contain areas of broadleaved woodland and species rich hedgerows.

5.4.37 No evidence of dormouse was found during the field surveys. There was one desk study record from 2009 at Lower Farm, 2667m from the land required for construction of the Proposed Scheme.

5.4.38 Ten sites, which include areas of broadleaved woodland and hedgerows, were identified through aerial photography and on-site scoping assessments as being suitable for dormouse. All ten are within the land required for the construction of the Proposed Scheme; however due to restricted access, they were not surveyed. These include:

- lane at Claydon Estate, Steeple Claydon, (020-HD1-077-001);
- farmland north of Grebe Lake, (020-HD1-079-002, 020-HD1-080-004);
- land at Preston Bissett, Buckinghamshire, (020-HD1-083-003);
- land north of Mill Mound, Preston Bissett, (020-HD1-083-004);
- land to the south-west of Ash Spinney, Chetwode, (020-HD1-084-001);
- farmland to the south and south-east of Chetwode, (020-HD1-084-002, 020-HD1-084-003);
- farmland at Newton Purcell, (020-HD1-086-001); and
- farmland lying on the north-west and south-east side of a road leading from Bicester to Buckingham, Shelswell, (020-HD1-087-004).

5.4.39 Dormouse surveys achieved good coverage across the majority of suitable habitat areas in or adjacent to the land required for construction of the Proposed Scheme. However, there are two locations where survey coverage was deficient due to lack of access: farmland around Portway Farm and several small woodlands around Chetwode. It cannot be concluded that dormouse are not present in these locations. At remaining locations such as Decoypond Wood, although survey coverage was not achieved due to refused site access, sufficient areas of suitable adjacent habitats were sampled and, therefore, it is unlikely that dormouse is present in the land required for construction of the Proposed Scheme in this area.

**CFA14 Newton Purcell to Brackley**

5.4.40 The land required for construction of the Proposed Scheme in this area consists of improved grassland and arable fields which are intersected with small areas of semi-

natural broadleaved woodland and hedgerows. Within the wider habitats, arable fields dominate and are lined with intact hedgerows.

5.4.41 Surveys were undertaken at eight locations within this area. Habitats surveyed include semi-natural broadleaved woodland north-east of Halse (020-HD1-099-001) and at Finmere Quarry (020-HD1-088-004). The remaining six locations surveyed in this area are within hedgerows. These are intact and dominated by hawthorn and blackthorn with occasional trees such as oak and sycamore. These include:

- Northfield House, Turweston (020-HD1-095-001);
- Warren Farm, Banbury Road, Finmere, Buckingham (020-HD1-089-003);
- land adjoining Warren Farmhouse, Finmere (020-HD1-089-004);
- land adjoining Shelswell Inn (020-HD1-087-001);
- land to the north-west of the road leading from Newton Purcell to Finmere (020-HD1-088-001); and
- land to the north of Warren Farm, Finmere (020-HD1-090-001).

5.4.42 No evidence of dormouse was identified during the field surveys and there were no desk study records of dormouse from this area.

5.4.43 Seventeen sites, which include a variety of habitats for dormouse such as broadleaved woodland, linear woodland strips with scrub and hedgerows, were identified through aerial photography and on-site scoping assessments as being suitable for dormouse. However, due to restricted access, these areas were not surveyed. All are within land required for construction of the Proposed Scheme. They include:

- broadleaved and coniferous woodland at land on the south side of the A421, Brackley (020-HD1-088-006);
- small area of broadleaved and plantation woodland at farmland at Church Lane, Mixbury, , (020-HD1-090-002);
- linear strip of broadleaved woodland and scrub at farmland at Banbury Road, Finmere (020-HD1-090-003);
- hedgerows at farmland south-west of Westbury (020-HD1-091-001);
- hedgerows at land forming part of disused Verney Junction to Banbury railway, (020-HD1-091-002);
- hedgerows at two parcels of land adjoining Grovehill Farm, Turweston, (020-HD1-092-001);
- hedgerows at land forming part of disused Verney Junction to Banbury railway at Mill House Farm (020-HD1-092-002);
- mixed woodland at land forming part of disused Verney Junction to Banbury railway at Grove Farm, (020-HD1-092-003);

- hedgerow with trees at land forming part of disused Verney Junction to Banbury railway at Fulwell Farm, (020-HD1-092-004);
- broadleaved woodland and hedgerows at Glebe Farm, south of Turweston (020-HD1-093-001);
- small area of broadleaved woodland at land near Turweston Airfield, Turweston, (020-HD1-094-001);
- small area of broadleaved woodland at land forming part of disused Verney Junction to Banbury railway at Field Farm House, Turweston (020-HD1-094-002);
- hedgerows at 2 Versions Bungalow, Northampton Road, west of Turweston, (020-HD1-095-002);
- woodland at Iletts Farm, west of Whitfield, (020-HD1-096-001);
- hedgerows at land on the east and west side of the road leading from Brackley to Helmdon, Radstone (020-HD1-096-002, 020-HD1-097-002); and
- hedgerows connected to broadleaved woodland at Cold Harbour Farm, Radstone, Brackley (020-HD1-096-003).

5.4.44 Although, a large number of sites could not be accessed to carry out field surveys; those surveys that were undertaken achieved wide coverage of suitable dormouse habitat in this area. It is, therefore, considered that dormouse is unlikely to be present, although this cannot be confirmed for all survey sites.

### **CFA15 Greatworth to Lower Boddington**

5.4.45 The majority of habitats surveyed within this area were hedgerows. They are largely intact, 1-2m in width and dominated by species such as hawthorn, blackthorn, willow (*Salix spp.*), bramble, oak, field maple, ash, elder, spindle (*Euonymus europaeus*) and dogwood (*Cornus sanguinea*). The habitats within the wider area are predominantly arable fields with small areas of broadleaved woodland.

5.4.46 Surveys were undertaken at eight locations in this area (see Table 91). No evidence of dormouse was identified during the surveys, and there were no desk study records from this area.

5.4.47 Seventeen sites were identified through aerial photography and on-site scoping as having habitat suitable for dormouse. All are within the land required for the construction of the Proposed Scheme except where stated. However, due to restricted access, these areas were not surveyed:

- hedgerows in land lying to the north of Helmdon Road, Greatworth (020-HD1-102-001);
- woodland to the north-west of Lower Thorpe Farm, lower Thorpe Mandeville (020-HD1-105-003);
- a narrow belt of deciduous woodland and several mature hedgerows in land

west of Culworth (020-HD1-106-002);

- a plantation woodland at Edgcote Mill and House, South of Culworth Road, Edgcote (020-HD1-107-001);
- a plantation woodland at Wardington Gate Farm, Edgcote, Chipping Warden, (020-HD1-108-001);
- a narrow belt of woodland along river Cherwell at Trafford House Farm, Chipping Warden, East of Welsh Road (020-HD1-108-002) which is 5m from the Proposed Scheme;
- a small patch of woodland with good connectivity to several other areas of woodland at Trafford Bridge Marsh, Culworth Mill and Osierbed Spinney (020-HD1-108-003);
- a conifer plantation in two parcels of land on the north-east and south-west sides of Welsh Road, Chipping Warden (020-HD1-109-001);
- a small woodland at Beeches Farm, north of Culworth Road, Chipping Warden (020-HD1-109-002);
- a newly planted woodland and hedgerows to the south-west of Manor Farm, west of Aston Le Walls (020-HD1-111-001);
- woodland along Highfurlong Brook to the south-west of Welsh Road, west of Aston Le Walls (020-HD1-112-001);
- woodland along Highfurlong Brook lying to the south-west of Welsh Road, west of Aston Le Walls; (020-HD1-112-002);
- woodland along Highfurlong Brooke at Old House Farm, south of Banbury Road, Lower Boddington (020-HD1-112-003);
- woodland along Highfurlong Brooke with connectivity at Paradise Farm, south of Banbury Road, Lower Boddington (020-HD1-112-004);
- a small area of woodland in the centre of the land parcel with good connectivity on the Southwest of Banbury Road, south-east of Lower Boddington (020-HD1-112-005);
- woodland along Highfurlong Brooke with connectivity at Manor Farm, south-west of Banbury Road, south of Lower Boddington (020-HD1-113-001); and
- hedgerows connecting to Fox Covert at Land on the north side of the road leading from Worm Leighton to Upper Boddington, east of Leisure Drive (020-HD1-115-001).

5.4.48 Although, a large number of sites were not accessed for dormouse surveys, those surveys that were undertaken achieved wide coverage of suitable dormouse habitat in this area. It is therefore considered that dormouse is unlikely to be present, although this cannot be confirmed for all areas.

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